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The foundations of college student leadership: Cognitive and personality correlates of leadership performance

Arnold Lee Leonard

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THE FOUNDATIONS OF COLLEGE STUDENT LEADERSHIP:
COGNITIVE AND PERSONALITY CORRELATES OF
LEADERSHIP PERFORMANCE

A Dissertation
Presented to
The Faculty of the School of Education
The College of William and Mary in Virginia

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Philosophy

by
Arnold Lee Leonard

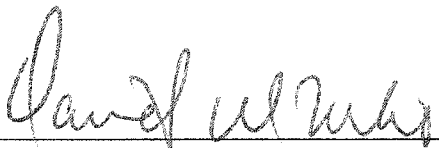
April 2005

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Arnold Lee Leonard

Approved April 2005



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DEDICATION

Earning a doctorate has been one of my personal goals for more than three decades. I can now say that I have achieved this goal, but it would be dishonest to claim that I achieved this goal by myself. I have no doubt that, were it not for the encouragement and support of my family, I would not have earned, and perhaps not even attempted, the degree. In acknowledgement of their critical roles, I dedicate this dissertation to my wife, Maria Leonard; my daughter, Sarah Leonard; and my parents, Arnold and Nancy Leonard.

Even though my parents' educations did not progress beyond high school, they were both very aware of the importance of education and encouraged my sisters and me to learn and go as far in school as we could. Although Mom and Dad must have worried at times, they never wavered in their support and never expressed alarm at the mixed results of my undergraduate efforts. My only regret is that my Father, who passed away several years ago, is not here to see me graduate. He would have been filled with pride.

Maria demonstrated endless patience and provided continuous support as I pursued this degree. Often, this meant that she voluntarily shouldered an extra burden, performing essential household tasks that I would have ordinarily done, while I was in the library or at the computer. Her encouragement and confidence in me was a deciding factor in my success.

Sarah's personal example of academic excellence, ambition, and tenacity was truly inspirational. At times, when the demands of my doctoral program seemed too great, I only had to consider her example to become reenergized.

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ABSTRACT

In this study, I examined the personality and cognitive bases for the leadership performance of college student leaders. I hypothesized two structural equation models. The first model related observed measures of the five-factor model of personality and critical thinking ability to leadership performance. The second model added a latent factor of creativity to the first model. Participants consisted of 413 (247 female, 166 male) undergraduate college students who were the formal leaders of student organizations at 13 colleges in North Carolina and Virginia. I also gathered leader performance data from 349 (216 female, 133 male) observers who were members of the leaders' organizations. Leaders completed the *Mini-Markers* personality inventory and *Watson-Glaser Critical Thinking Appraisal* (WGCTA, Form B) as measures of the independent variables, and the *Multifactor Leadership Questionnaire* (MLQ, Form 5X) as a measure of the dependent variable. Observers completed the rater version of the MLQ. Factor analysis of the study instruments replicated the 5-factor structure of Mini-Markers, and found a 1-factor solution for the WGCTA and a 3-factor solution for the MLQ. Paired-sample *t* tests of self- and observer-rated MLQ scales revealed significant

differences on 9 of 14 scales. Analysis of the hypothesized structural equation models yielded support for both models, but revealed that critical thinking had virtually no influence on leadership performance. Implications for college student leadership development programs are discussed.

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EDUCATIONAL POLICY, PLANNING, AND LEADERSHIP PROGRAM

THE COLLEGE OF WILLIAM AND MARY IN VIRGINIA

THE FOUNDATIONS OF COLLEGE STUDENT LEADERSHIP:
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CHAPTER I

THE PROBLEM

Statement of the Problem

For thousands of years, societies around the world have recognized the importance of leadership to the success of social groups and discussed the qualities of effective leaders. In the last four decades intensive philosophical and scientific study of leadership has revealed much about the effects and mechanisms of leadership, as well as the behaviors and characteristics of effective and ineffective leaders. Many institutions of higher education in the United States have established leadership development programs for their students and formally adopted educational goals related to the preparation of their students for positions of leadership in society (Cress, Astin, Zimmerman-Oster, & Burkhardt, 2001; D. C. Roberts, 1997). Yet, despite the extensive study of leadership and increasing efforts to develop leaders on the nation's college campuses, little is actually known about the personality and cognitive attributes that form the foundation for effective leadership performance.

Although leadership effectiveness is influenced, sometimes very strongly influenced, by situational variables, there is persuasive evidence that the personality and cognitive attributes of the leader do, indeed, play a major role in determining leadership effectiveness. Despite extensive research evidence supporting the importance of personality and cognitive attributes in determining leadership success, few studies exist which examine these

attributes in combination. Of those studies that do examine the influence of both cognitive and personality attributes, a substantial number employ cognitive, personality, or leadership assessment instruments that are not convincingly validated.

Even though the precise wording of the mission statements of institutions of higher education differs from institution to institution, all colleges and universities share the common goal of strengthening and refining the cognitive skills and attributes of students. In addition, virtually all colleges and universities seek to influence the personalities of their students. Institutions of higher education have an effect on their students' expression of personality by shaping students' values, perspectives, habits, behaviors, biases, insights, etc. Over time, and especially in the change- and growth-oriented atmosphere of a college or university campus, these influences can alter the cognitive and affective base from which personality is expressed. If colleges and universities are to achieve their specified or implied mission of producing graduates who are well equipped to serve as effective leaders in society, these institutions must understand how cognitive and personality attributes combine in college students and interact with environmental variables to determine leadership success. This understanding is prerequisite to the design of effective leadership development interventions.

Research Goals

The purpose of this study was to examine the relationships between personality factors, critical thinking ability, and leadership performance in an

undergraduate student population. This was a confirmatory study. It tested two hypothesized models of leadership that were based on a synthesis of previous leadership research. In the course of investigating these models of leadership, the study also examined the factor structure of the dependent and independent variable measures.

The Importance of Leadership

In his comprehensive review of leadership, Bass (1990) describes Egyptian hieroglyphics from 3,000 B.C., representing the concepts of leadership, leader, and follower, as evidence of the long conceptual history of leadership. He also points to the descriptions of leaders and the prescriptions for effective leadership contained in the Old and New Testaments, ancient Icelandic sagas, Greek and Roman legends, Chinese classics from the Eastern Zhou dynasty, as well as Machiavelli's more modern *The Prince* to illustrate the long-term preoccupation that people have had with the subject of leadership. This interest in leadership appears only to have intensified in the modern era and has become the focus of more than just scholars and philosophers.

In a 1999 *BusinessWeek* survey of 587 "large global companies" the 273 respondents reported spending an average of approximately \$10 million on executive education in 1998. The same survey reported total 1998-1999 revenues for the top 20 executive education providers of \$416.9 million (Reingold, Schneider, & Capell, 1999). Four years later, the 2003 *BusinessWeek* executive education survey reported that the top 20 executive education providers had revenues of \$648.5 million in 2002-2003 (Merritt,

2003). This is a 56% increase in revenues despite the severe economic downturn of that period. Overall, Fulmer (1997) reported annual, presumably worldwide, corporate expenditures on management training and education of \$45 billion, and Reingold et al. (1999) reported corporate management training and education expenditures of \$16.5 billion in the United States alone.

One simple gauge of the public's interest in leadership is the number of books published on the subject. A recent search of the Amazon.com website returned the titles of more than 14,200 books indexed under the subject of leadership. The widespread interest in leadership is not confined to the lay public. Social scientists have performed an enormous number of leadership studies, most of which have been conducted in the last 40 years. A recent search of the PsycINFO database revealed over 6,850 citations for references categorized under the subject heading "leadership," all but four of which were published between 1965 and today. A similar search of the ERIC database, using the keywords "leadership" and "leadership training," yielded over 10,900 citations for works published since 1961 but only 89 citations for works published prior to 1961. Although these numbers illustrate the extensive interest in leadership in recent decades, they clearly underestimate the number of leadership studies conducted in the first half of the twentieth century. For example, Stogdill's (1948) comprehensive survey of the literature concerning personality factors associated with leadership cites 124 studies completed between 1904 and 1947, and his follow-up surveys conducted in 1970 found an additional 213 studies (Stogdill, 1974).

The evidence of history, organizational climate studies, and team performance studies support the widely held belief that leadership matters, because the efforts of leaders result in important outcomes that directly affect the quality of human life (Bass, 1990; Hogan, Curphy, & Hogan, 1994). One only has to consider the influence of historical leaders like Alexander the Great, Mohandas Gandhi, Martin Luther, or Adolph Hitler to be convinced of the importance of leadership on the world stage. On a smaller scale, studies have shown that leadership plays an important role in managerial performance ratings (Hater & Bass, 1988), supervisor induced worker stress (Hogan, Raskin, & Fazzini, 1990), business unit performance (Howell & Avolio, 1993), and performance on group creativity (Sosik, 1997).

Particularly important to organizations of all types are the effects of transformational leadership. An outgrowth of James MacGregor Burns' (1978) concept of "transforming" leadership, transformational leadership purportedly yields greater organizational productivity by motivating organizational members to subordinate personal interests to those of the organization, exert a level of effort well above that which is normally expected, and break out of habitual ways of thinking in order to develop creative solutions to organizational problems (Bass, 1985).

The belief that leadership is important is also reflected in the rapid growth of leadership development programs on college campuses. In the United States, college leadership development programs, ranging in scope from short part-day workshops to doctoral degrees, doubled in number to approximately

700 programs in just the four-year period of 1994 to 1998 (Reisberg, 1998). My own survey of Virginia colleges and universities found 31 leadership programs at 16 of the approximately 40 general bachelor degree granting institutions in the state. Many colleges and universities believe that leadership development is so important that they have included it as an educational goal in their official mission statements (Cress et al., 2001; D. C. Roberts, 1997). My review of the undergraduate college catalogs of 33 institutions in Virginia revealed that 18 included the development of their students as leaders as part of the institution's official mission or purpose. External demand and resources have helped spur the growth of college leadership development programs. For example, during the period of 1990 to 1998, the W. K. Kellogg Foundation provided \$14.1 million to fund 31 leadership development projects for college-age individuals (Zimmerman-Oster & Burkhardt, 1999). The Kellogg Foundation undertook this effort in response to a perceived crisis of leadership in America and the belief that, "...the college environment is a strategic setting for learning these skills and theories [of leadership]" (Zimmerman-Oster & Burkhardt, 1999, p. i). The military services' Reserve Officer Training Corps (ROTC) programs collectively constitute the largest externally-driven college level leadership development program in the nation. With programs in every state and territory of the United States and existing on over 1,000 college and university campuses, Army, Navy, and Air Force ROTC programs in combination enroll more than 54,000 students in leadership development instruction and practical experiences.

Limitations

Several aspects of the design of this study impose limitations on the utility of the resultant data and conclusions that can be drawn from the data. The population to which the findings of the study can be confidently extended is limited by the unique nature of the subject pool. The focal research subjects of this study were the formally designated student leaders of officially recognized college student organizations from 13 colleges and universities in North Carolina and Virginia. In addition, leadership performance data were gathered from observers who were members of the student leaders' organizations. It is likely that individuals in this subject pool differ from college students in general, and this likelihood limits the degree to which study data can be generalized to other populations.

A second limitation of the study is that the self-report Mini-Markers personality inventory and Multifactor Leadership Questionnaire instruments may suffer from self-serving "faking good" biases. It may also be the case that observer ratings of different dimensions of leader performance suffer from a halo effect. If active, such biases would reduce the validity of the instrument data and the conclusions subsequently drawn from those data.

This study is also limited by its investigation of only two observed independent variables, personality and critical thinking, as predictors of leadership performance. The research literature suggests that other variables, such as general intelligence, emotional intelligence, judgment, locus of control, etc. are also important correlates to leadership performance.

Procedures

Potential participants were identified by obtaining rosters of officially recognized student organizations, their leaders, and leader contact information from institutional websites or from the Student Affairs office or equivalent of 13 colleges and universities in North Carolina and Virginia. Three universities had student leader contact information publicly available on their institutional websites. For these institutions, I simply downloaded the information. For the remaining 10 institutions, I obtained student leader contact information from institutional officials.

Student leaders were contacted by electronic mail (Appendix A) to determine if they were willing to participate in the study. This initial contact email contained a unique user identification and password for each student as well as a hyperlink to a secure Internet site where the study was hosted. After reading and responding to an informed consent disclosure (Appendix B), those who agreed to participate were admitted to the area of the website containing the research instruments. There, student leaders were able to complete a short demographic questionnaire (Appendix C) and three research instruments. The three research instruments were the Mini-Markers personality inventory (Saucier, 1994), Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980), and the self-report form of the Multifactor Leadership Questionnaire (Bass & Avolio, 2000).

As part of the demographic questionnaire, student leaders were asked to nominate three members of their organizations who knew the leaders well

enough to rate the leader's leadership performance. These observers were subsequently contacted by email (Appendix D) and invited to participate in the study using the same methods as were used for the student leaders. Observers completed a demographic questionnaire (Appendix E) and the rater form of the Multifactor Leadership Questionnaire (Bass & Avolio, 2000).

The two hypothesized models, which relate personality and cognitive attributes to leadership effectiveness were tested using path analysis and structural equation modeling.

Definition of Terms

The following key terms and their operational definitions are used in this study.

Cognitive complexity. The individual's capacity to perceive, comprehend, and manipulate information. Cognitive complexity includes the individual's ability to screen large quantities of information, select information that is relevant to the issue or goal, synthesize new information with existing information, and analyze the synthesized information to discern implications for the issue or goal.

Creativity. The ability to exercise personal discretion to produce novel and effective solutions to ill-defined problems in complex and ambiguous environments.

Critical thinking. The American Philosophical Association's definition of critical thinking was used in this study: "...purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as

explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based” (Facione, 1990, p.2)

Leadership. A large number of definitions of leadership have been offered by leadership researchers. Leadership has been conceptualized as the exercise of power (Burns, 1978), shaping and influencing of organizational culture (Schein, 1992), transformation and inspiration of followers (Bass, 1985), consensus building and work facilitation (Yukl, 2001), and influencing others (Rauch & Behling, 1984). This study employed the interpersonal influence view as its operational definition of leadership. Espousing this view, Rauch and Behling (1984, p. 46) define leadership as “the process of influencing the activities of an organized group toward goal achievement.” The exercise of leadership includes such leader behaviors as establishing conditions that promote follower motivation, providing purpose and vision, giving direction, making decisions, solving problems, and facilitating group processes and effort. This operational definition of leadership addresses only the purpose or function of leaders. The actual execution of leadership occurs within the context of a complex system of interacting elements that includes leader, follower, and organizational characteristics as well as situational factors.

Leadership performance. As used in this study, leadership performance includes both process and outcomes. It addresses the behaviors that an individual exhibits when attempting to exert leadership, and the outcomes of the leader's efforts. This term encompasses both the interpersonal influence

definition of leadership given above, and the success of the leader in facilitating and achieving organizational goals.

Summary

Many colleges and universities have embraced the mission of producing graduates who are well equipped to discharge leadership roles in society. Although leadership research conducted over the last four decades clearly indicates that personality and cognitive attributes are strongly related to leadership effectiveness, the combined effects of personality and cognitive attributes have not been well studied. If institutions of higher education are to design maximally effective leadership development programs, they must understand the role and interplay of personality and cognitive attributes in determining the leadership effectiveness of their students. This study hypothesized and sought to test two leadership models that combine personality and cognitive attributes to predict leadership effectiveness.

Chapter II reviews selected literature pertaining to personality and cognitive attributes and their relationship to leadership performance. The goal of chapter II is to paint a verbal picture of what is known about personality and cognition as determinants of leadership success, and to reveal the shortcomings in the existing literature that this study is designed to address.

CHAPTER II

REVIEW OF THE LITERATURE

Leader Functions and Qualities

Leaders are elected, hired, appointed, or accepted by groups because the members expect the leader to benefit the group by helping it achieve its purpose and goals (Stogdill, 1948). The leader helps the group by exercising power (Burns, 1978), providing direction (Jacobs & Jaques, 1990) and vision (Bass, 1985), establishing and guiding organizational culture (Schein, 1992), influencing others (Rauch & Behling, 1984; Yukl, 2001), making decisions, and inspiring effort (Jacobs & Jaques, 1990; U.S. Department of the Army, 1999) and commitment. These functions require the leader to be dedicated to the group, motivated to lead (Chan & Drasgow, 2001), and to possess the capacities and skills for creative and critical thought (Mumford & Connelly, 1991), sense making, problem solving (Mumford & Connelly, 1991), communication, and interpersonal empathy. Leaders must be open to new experiences and ideas and adept at scanning the environment (U.S. Department of the Army, 1987) so that they can identify opportunities and possibilities for their groups. They must be comfortable working in ambiguous environments to make decisions based on reason and judgment even when information is incomplete and the future uncertain (Mumford & Connelly, 1991). Finally, leaders must be genuinely enthused about the work of their

groups and able to convey and model this enthusiasm for both members and non-members.

Transformational Leadership

Since House published his study of charismatic leadership (House, 1977) and James MacGregor Burns (1978) introduced the concept of “transforming” leadership, much of the effort of leadership researchers has focused on the ability of leaders to produce transformational effects on their followers and organizations. This line of research was significantly advanced by Bernard Bass (1985) who has remained a prolific investigator of transformational leadership to the present day. Building on Burns (1978) description of the ability of leaders to personally engage with followers so that followers became inspired to greater effort and commitment, Bass (Avolio, Waldman, & Yammarino, 1991; Bass, 1985, 1998) developed a framework of transformational leadership consisting of five components (Antonakis, Avolio, & Sivasubramaniam, 2003; Bass & Avolio, 2000) which he labeled idealized influence (attributed), idealized influence (behavior), inspirational motivation, intellectual stimulation, and individualized consideration. *Idealized influence (attributed)* describes the follower's perception of the charismatic qualities of the leader, whereas *idealized influence (behavior)* describes the charismatic behaviors of the leader. Charismatic qualities and behaviors are those which indicate confidence, power, and values (Antonakis et al., 2003). Charisma causes followers to admire and seek to become like the leader. *Inspirational motivation* requires that the leader communicate a compelling vision of the

future to build follower commitment and enthusiastic support. *Intellectual stimulation* spurs follower creativity by questioning limiting assumptions and encouraging divergent thinking. *Individualized consideration* requires that the leader take a mentor-like role, recognizing and demonstrating concern for the individual circumstances, goals, and needs of the follower.

Researchers have gathered considerable evidence supporting the positive relationship between transformational leadership behaviors and a variety of measures of leadership effectiveness (Bass, 1997; Howell & Avolio, 1993; Lowe, Kroeck, & Sivasubramaniam, 1996; Yammarino & Bass, 1990). In addition, evidence suggests that transformational leadership theory is robust across cultures (Bass, 1997).

Despite the strong emphasis that it has received over the past two decades, transformational leadership is not the only form of leadership behavior, and it is not even the only effective form of leadership behavior. Indeed, Bass and Avolio (Antonakis et al., 2003; Avolio, Bass, & Jung, 1999) describe a “full range” of leadership consisting of nine leadership factors in three groups. At the upper end of the range are the very active and involved five transformational leadership factors described above. The next level, transactional leadership, consists of three leadership factors related to the establishment and enforcement of goals and performance standards, as well as the delivery of rewards for satisfactory performance. The first of these the transactional factors is *contingent reward* leadership, which involves the exchange of a reward from the leader in return for the desired performance of

the follower. The other two transactional leadership factors are *management-by-exception (active)* and *management-by-exception (passive)*. Management-by-exception is characterized by the leader taking action only when a problem occurs in the organization. In the active form, the leader continually scans the organization for indications of emerging problems, and takes action to solve the problems before they grow. In the passive form, the leader takes action only when a problem or crisis has fully emerged. At the lower end of the full range of leadership is the very inactive *laissez-faire* leadership. Laissez-faire leaders are leaders in name, but they are largely disconnected and uninvolved in the organization that they purport to lead.

Effective leaders may employ a variety of both transformational and the active forms of transactional leadership behaviors. The choice and effectiveness of leadership behaviors can be influenced by a variety of factors including organizational culture and norms, hierarchical level of the leader, individual characteristics of leader and followers, internal and external stakeholders, desired outcomes, etc. (Antonakis et al., 2003).

The Bases for Leadership Effectiveness

The foundation from which the leader operates consists of the leader's basic cognitive abilities and personality attributes. These individual dimensions help establish the boundaries of the leader's behavior. Leadership success requires that the leader possess the cognitive power (Jaques & Clement, 1994; Mehlretter, 1996) and skills needed to resolve the challenges that he or she encounters. Similarly, the nature and strength of the leader's

personality traits must be sufficient to make it likely that the leader will select appropriate behaviors for a given situation and be comfortable in performing those behaviors. Leadership knowledge and procedural skills are useful to leaders and often enhance leadership effectiveness. Such knowledge and skills constitute the tools of leadership. They can be readily taught and learned, but they alone do not determine the success of the leader. It is the core cognitive and personality dimensions of the leader that will determine whether the leader will learn, select, and properly use the tools of leadership.

Cognition

The relationship between cognitive factors and leadership has been a focus of leadership research for nearly a century. As mentioned earlier, group members expect the leader to benefit the group by helping it achieve its purpose and goals (Stogdill, 1974). In order to help the group, the leader must gain an accurate understanding of the organizational system and the external environment that affects the organizational system. The leader must assess the organization's situation, develop plans to resolve deficiencies and capitalize on strengths, communicate the plan to organizational members, and monitor the execution of the plan, making plan adjustments as needed. Thus, the cognitive attributes required of leaders pertain primarily to the functions of situational perception, information processing, planning, and problem solving. Research has associated a wide number of cognitive attributes with leadership. These attributes can be grouped into three related categories: intelligence, the ability to deal with complexity, and the ability to solve problems.

Intelligence

Studies examining the relationship between intelligence and leadership have consistently found moderate positive correlations between various measures of leader intelligence and leadership attainment, perception, and performance. Stogdill (1948) reviewed 124 leadership studies conducted between 1904 and 1947 and found 27 studies that discussed intelligence as a leader trait. Of these 27 studies, 23 reported that the leader (mainly student leaders in primary and secondary schools) had a higher intelligence than the average intelligence of the members of the leader's group. Sixteen of these studies correlated leadership with measures of intelligence, yielding an average correlation of approximately .28. In a follow-up survey Stogdill (1974) reviewed an additional 163 studies of leadership characteristics conducted between 1948 and 1970 and found 25 studies that reported a positive relationship between intelligence and leadership.

There is some evidence that there are limits to the benefit of intelligence for leaders. Ghiselli (1963) found a strong curvilinear relationship between intelligence and managerial success in three groups of managers. He reported that "...those individuals earning both low and very high scores [were] ...less likely to achieve success in management positions than those with scores at intermediate levels." (p. 898).

Bray and Howard (Bray, Campbell, & Grant, 1974; Bray & Howard, 1983; Howard & Bray, 1990) conducted a thirty-year longitudinal study of Bell System managers. Beginning with 422 individuals who had become Bell

System managers in the mid- to late-1950s, Bray and Howard administered a wide variety of assessments including assessment center simulations, personality measures, and tests of cognitive ability. Cognitive ability was assessed primarily by the School and College Ability Test (SCAT) and the Critical Thinking in Social Science Test (Bray et al., 1974). Participants were reassessed on these tests at years 8 and 20 of the study. Intelligence, as measured by the combined verbal and quantitative score of the SCAT, was a strong predictor of managerial success at year 20 ($r = .40, p < .001$) (Bray & Howard, 1983), as was critical thinking ability ($r = .41, p < .005$) (Howard & Bray, 1990). Factor analysis of the simulations and other tests of ability identified three primary factors which were labeled administrative ability, interpersonal ability, and cognitive ability. Of these three factors, the cognitive ability factor proved to be most important predictor of managerial success at year 20 ($r = .38, p < .005$) (Howard & Bray, 1990).

In a meta-analysis of 18 studies that examined the relationship between intelligence and leadership, Lord, De Vader, and Alliger (1986) found a mean correlation between intelligence and leadership of .50. Although the Lord et al. (1986) meta-analysis has been widely influential, resulting in more than 125 citations, a more recent and comprehensive meta-analysis conducted by Judge, Colbert, and Ilies (2004) found a more modest correlation between intelligence and leadership of .27 (corrected for range restriction). In discussing the divergent findings between the two meta-analyses, Judge et al. (2004) note that their meta-analysis is more likely to be representative of the relationship

between intelligence and leadership because it employed correlations from 151 independent samples, whereas the Lord et al. meta-analysis employed only 18 correlations. Additionally, nearly 25% of the studies analyzed by Lord et al. used measures of perceived intelligence rather than more objective paper-and-pencil measures of intelligence. In contrast, only a little more than 5% of the studies analyzed by Judge et al. used measures of perceived intelligence. Perceived intelligence has been shown to correlate much more strongly with leadership than objectively measured intelligence (Judge et al., 2004).

Complexity

Cognitive complexity or power (Jacobs & Jaques, 1990; Jaques, 1989; Mumford & Connelly, 1991) refers to the individual's capacity to perceive, comprehend, and manipulate information. To effectively comprehend and resolve organizational challenges, the leader's cognitive complexity must be equal to or greater than the situational complexity that the leader faces. Cognitive complexity becomes an increasingly important leader characteristic at higher levels of leadership where the leader must deal with a large multifaceted organization pursuing complex organizational goals over extended periods of time (Jaques & Clement, 1994; Mumford, Zaccaro, Harding, Fleishman, & Reiter-Palmon, 1993; U.S. Department of the Army, 1987). In such situations, the leader must be able to continuously screen large quantities of sometimes conflicting information, select information that is relevant to the accomplishment of the organizational mission and goals, synthesize the selected information with the existing understanding of the

organizational system and external environment, and analyze the revised situational understanding to discern implications for the accomplishment of the organizational mission and goals (Coumbe, Leonard, & Brown, 1999; Fleishman et al., 1991; Kickul & Neuman, 2000). As Yukl (2001) explains cognitive complexity:

A person with low cognitive complexity sees things in simplistic black and white terms and has difficulty in seeing how many diverse elements fit together to make a meaningful whole. A person with high cognitive complexity is able to see many shades of gray, and is able to identify complex patterns of relationships and predict future events from current trends. (p. 194)

Problem Solving

One of the most important ways that leaders contribute to their organizations is by solving organizational problems. The ability of the leader to solve problems is closely related to the leader's intelligence, cognitive complexity, and relevant domain knowledge. Problem solving, however, requires more than just possessing a high degree of intelligence, cognitive ability, and domain knowledge. The leader must be able to apply these capacities in creative ways to produce solutions that best meet the needs of the organization under the existing circumstances. The organizational problems that leaders must solve are often ill-defined (Mumford & Connelly, 1991), without clear criteria against which proposed solutions can be weighed. This is especially true for higher level leadership positions with complex systems and

long planning horizons. Such problems require critical thinking ability, cognitive complexity (Jaques & Clement, 1994), “abstract integrative thinking skills” (Jacobs & Jaques, 1990, p. 283), and an individual tolerance for ambiguity and uncertainty.

Problem Solving and Creativity

Viewing leadership in the context of sociotechnical systems theory, Mumford and Connelly (1991) argue that organizational leadership requires creativity. They base their conclusion on the similarities between the characteristics of the organizational leader’s task and the characteristics of creative acts in general. First, organizational leadership and creativity are both productive acts. Leaders produce novel solutions to problems by performing “boundary role” functions aimed at influencing organizational members and subsystems so that organizational goals are accomplished. Second, organizational leadership and other forms of creative acts are often performed in complex and ambiguous environments, and their problems and products are typically ill-defined at the outset. Third, both organizational leaders and other creative individuals exercise “..some degree of personal discretion concerning exactly when, where, how, and why action will be taken” (Mumford & Connelly, 1991, p. 293). According to Mumford and Connelly (1991), these characteristics of the leader’s task, the exercise of discretion in the production of solutions to ill-defined problems, are defining characteristics of creativity. Therefore, leaders are creators and leadership is a creative act.

Clearly, the creative act of producing novel solutions to complex ill-defined problems requires that the organizational leader possess an array of well-developed cognitive skills. First, the leader must possess relevant knowledge. It is useful for the leader's knowledge base to go beyond the apparent domain of the problem, because concepts from other domains may suggest novel approaches to problem solution. Beyond possessing knowledge, the leader must be able to determine when existing knowledge structures are inadequate for the problem at hand and reorganize knowledge structures to facilitate problem solution (Mumford & Gustafson, 1988). Other cognitive capacities which underlie creativity include intelligence, cognitive complexity, divergent thinking, critical thinking, metacognition, and many others (Feldhusen & Goh, 1995; Mumford & Connelly, 1991). In addition to cognitive capacities, creativity is linked to personality factors such as the desire for new and novel experiences (McCrae, 1987), nonconformance, independence, an internal locus of control (Runco as cited in Feldhusen & Goh, 1995), extraversion (L. A. King, McKee Walker, & Broyles, 1996), and others.

Problem Solving and Reflective Judgment

Well developed reflective judgment (P. M. King & Kitchener, 1994) is an important aspect of the leader's ability to resolve the sort of ill-defined real-world problems that leaders and organizations often face. King and Kitchener's (1994) Reflective Judgment Model addresses the development of "epistemic cognition," which consists of the beliefs that an individual holds, "...about the limits of knowing, their certainty of knowing, and the criteria for knowing" (P.

M. King & Kitchener, 1994, p. 12). The model is comprised of seven stages, each characterized by qualitatively different ways of reasoning about ill-structured problems (Hofer & Pintrich, 1997). King and Kitchener's (1994) descriptions of the seven stages of the Reflective Judgment Model can be summarized as follows. The first three stages of the RJI are classified as "pre-reflective." In these stages knowledge is assumed to be certain and knowable even if it may not be known at the moment. The pre-reflective individual defers to the opinions of authority figures to justify knowledge beliefs. In the "quasi-reflective" stages four and five, knowledge is seen as uncertain and dependent upon context and perceptions. Reasoning and evidence are applied in a somewhat unbalanced way to justify knowledge beliefs in stage four, but in stage five, reasoning and evidence are applied in a better balanced and impartial way. True reflective thinking is attained in stages six and seven in which the individual comes to know and accept that some knowledge may be unattainable and that knowledge beliefs and problem solutions are justified by weighing evidence and probabilities. Reflective judgment is strongly tied to educational level with average reflective judgment levels progressing from 3.2 for a sample of high school students, to 3.6 for college freshmen, 4.0 for college seniors, and 4.76 for graduate students (P. M. King & Kitchener, 2002). While these gains may seem small, the growth in reflective judgment during the undergraduate years represents an effect size of approximately one standard deviation (Wood, Kitchener, & Jensen, 2002).

Critical Thinking

Critical thinking is a common thread that links the cognitive leadership attributes of intelligence, cognitive complexity, and problem solving (including reflective judgment). A simple search of the Internet yields dozens of definitions of critical thinking, which vary widely in their scope and rigor. One of the most extensive efforts to define critical thinking and identify the qualities of the “ideal critical thinker” was conducted by the American Philosophical Association from February 1988 to November 1989. This study employed the Delphi Method and engaged a panel of 46 experts to identify the skills and dispositions that define critical thinking, as well as to develop recommendations for the instruction and assessment of critical thinking. The panel defined critical thinking in its consensus statement by saying: “We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based” (Facione, 1990, p. 2). Recognizing that critical thinkers must possess not only the cognitive skills of critical thinking, but also the disposition that leads to the routine use of critical thinking skills, the panel described (Facione, 1990) the ideal critical thinker as:

The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to

reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. (p. 2)

Although dispositional qualities are clearly important in determining if and how the individual will employ critical thinking skills, critical thinking assessment instruments typically directly measure only the application of cognitive critical thinking skills and then infer the existence of the dispositional components of critical thinking from the apparent motivation of the individual to apply the cognitive skills. The *Watson-Glaser Critical Thinking Appraisal* (WGCTA), one of the most widely used measures of critical thinking, is one such instrument. The WGCTA views "...critical thinking as a composite of attitudes, knowledge, and skills" (Watson & Glaser, 1980, p. 1). The essential attitudes, knowledge, and skills are described as:

(1) attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true; (2) knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined; and (3) skills in employing and applying the above attitudes and knowledge. (p. 1)

Watson and Glaser (1980) describe five WGCTA subtests used to assess these attitudes, knowledge, and skills:

Test 1. *Inference*. Discriminating among degrees of truth or falsity of inferences drawn from given data.

Test 2. *Recognition of Assumptions*. Recognizing unstated assumptions or presuppositions in given statements or assertions

Test 3. *Deduction*. Determining whether certain conclusions necessarily follow from information in given statements or premises.

Test 4. *Interpretation*. Weighing evidence and deciding if generalizations or conclusions based on the given data are warranted.

Test 5. *Evaluation of Arguments*. Distinguishing between arguments that are strong and relevant. (p. 2)

Using the component measures of the WGCTA as an operational definition of critical thinking, the linkage between critical thinking and the cognitive attributes of leadership, (intelligence, cognitive complexity, and problem solving) can be seen readily.

Critical thinking and intelligence.

From the viewpoint of Gardner's (1983) theory of multiple intelligences, critical thinking is virtually synonymous with the problem solving and scientific reasoning abilities that define Gardner's logical-mathematical intelligence. In fact, virtually all researchers agree that general intelligence (*g*) "reflects the ability to reason, solve problems, think abstractly, and acquire knowledge" (Gottfredson, 1997, p. 93). Reasoning, problem solving, and abstract thinking abilities are defining characteristics of critical thinking and are central to the WGCTA.

The relationship between critical thinking, as measured by the WGCTA, and general intelligence is well documented. Watson and Glaser (1980) report significant correlations between the WGCTA and traditional measures of general intelligence, such as the *Otis-Lennon Mental Ability Test*, *Stanford Achievement Test*, and *California Achievement Tests* ranging from .30 to .81 for high school and college students. Watson and Glaser (1980, p. 13) also report that “high correlations are found with other ability measures, such as the *Miller Analogies Test*, the *College Entrance Examination Board*, the *Scholastic Aptitude Test*, and the *American College Test*.” Significant correlations for these measures range from .29 to .69 for several college student samples. In a more recent study, Moutafi, Furnham, and Crump (2003) calculated the correlation between general intelligence and the WGCTA to be .60. Because of the strong relationship between the WGCTA and standard measures of general intelligence, some researchers have used the WGCTA as a surrogate intelligence test. For example, Mosher (1999) used the WGCTA to estimate IQ scores of management assessment candidates and Moutafi et al. (2003) used the WGCTA as a direct measure of fluid intelligence. Despite the correlations between intelligence and WGCTA scores reported by Watson and Glaser, they state that factor analysis of the WGCTA supports the contention that the WGCTA “is measuring a unidimensional aspect of ability” and that this dimension “can be seen as distinct from overall intellectual ability” (p. 13).

Critical thinking and cognitive complexity.

Critical thinking and cognitive complexity can be seen as corequisites for each other. Critical thinking involves the exercise of judgment based on evidence, concepts, methods, criteria, or context to produce “interpretation, analysis, evaluation, and inference” (Facione, 1990, p. 2). Critical thinking thus clearly requires the abilities to perceive, comprehend and manipulate information, which are basic elements of cognitive complexity. On the other hand, as described by many leadership and management researchers, cognitive complexity also refers to the ability to discern patterns and trends (Yukl, 2001), and to develop mental schemas (Mumford & Connelly, 1991), also referred to as “frames of reference” (U.S. Department of the Army, 1987) or “causal maps” (Jacobs & Jaques, 1990), that explain the components, rules, and principles that comprise and govern the organization as an open system. Patterns, trends, and schemas identified by the leader serve an important function for both the leader and the organization by making sense of or simplifying complexity and thereby facilitating planning, decision making, and action (Jacobs & Jaques, 1990; Mumford & Connelly, 1991). Critical thinking skills, such as those measured by the WGCTA (inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments), as well as others are essential to the leader’s ability to make sense of situational ambiguity and complexity.

Critical thinking and problem solving.

Watson and Glaser (1980) equated critical thinking to the cognitive skills required for effective problem solving, and the WGCTA is built around a problem solving definition of critical thinking. In defining the concept of critical thinking, Watson and Glaser (1980) listed five abilities, identified by Dressel and Mayhew, that “appear to be related to the concept of critical thinking:”

- The ability to define a problem
- The ability to select pertinent information for the solution of a problem
- The ability to recognize stated and unstated assumptions
- The ability to formulate and select relevant and promising hypotheses
- The ability to draw valid conclusions and judge the validity of inferences (p. 1)

Watson and Glaser cited research studies and the judgments of other researchers to conclude that the WGCTA constitutes “an adequate sample of the above five abilities and that the total score yielded by the test represents a valid estimate of the proficiency of individuals with respect to these aspects of critical thinking” (1980, p. 1).

Watson and Glaser were not alone in emphasizing the relationship of critical thinking and problem solving. Brabeck defined critical thinking as a “composite of skills involving logical reasoning and/or problem solving” (1983, p. 24). Halpern described critical thinking as “the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions” (2001, p. 23). Finally, Facione (1998) related the definition of critical

thinking developed by the American Philosophical Association's expert panel (Facione, 1990) to problem solving by showing that the core skills of critical thinking are required by the problem solving process. Interpretive ability is needed to recognize and define the problem, analytic skills are needed to compare potential problem solutions, evaluative skills are required when judging the credibility of information, and inferential ability is essential for identifying the implications of information and decisions (Facione, 1998).

Personality

Some of the earliest attempts to explain leadership fall into the category of "great-man" theories. According to this approach, scholars examined the lives of great leaders to determine the personal qualities that they possessed that enabled them to change the course of history. It was a short step from the analysis of great historical leaders to the development of trait theories of leadership (Bass, 1990).

Trait Theories

Trait theories dominated leadership research for the first half of the twentieth century but eventually fell out of favor, partially because of Stogdill's (1948) review of the trait theory literature (Bass, 1990). In this review, Stogdill supported the idea that traits were important determinants of leadership and described leaders, as compared to followers, as being more intelligent, dependable, socially active, persistent, self-confident, insightful, adaptive, cooperative, and verbally fluent. He also emphasized the importance of the demands of the situation in which the leader must function (Stogdill, 1948).

His influential review and had the unintended consequence of diverting leadership research largely away from traits and to situational determinants of leadership outcomes (Bass, 1990). Stogdill, however, persisted in his study of leadership traits. In his 1970 follow-up review, Stogdill again found consistent evidence for leadership characteristics such as "...responsibility and task completion, vigor and persistence in pursuit of goals, venturesomeness and originality in problem solving, ...self-confidence and sense of personal identity, ...readiness to absorb interpersonal stress, [and] willingness to tolerate frustration and delay..." (Stogdill, 1974, p. 81).

Personality scholars also developed trait theories, although their goal was to describe and categorize the full range of human behavior rather than identify only those traits that are characteristic of leaders. Goldberg (1993) traced modern trait theory research to Sir Francis Galton's work of the late nineteenth century in which Galton scoured a dictionary to identify terms that were descriptive of personality and then sorted the terms into groups sharing similar meanings. This early work illustrates the assumptions of the "lexical hypothesis," which posits that words naturally evolve to describe important human characteristics and that the relative importance of a personality trait is reflected in the number of descriptive terms that exist in the language for the trait.

The development of factor analysis helped personality trait research immensely. L. L. Thurstone used factor analysis in 1934 to examine sixty common personality descriptors and found that the sixty descriptors could be

summarized by only five factors. A decade later, Raymond Cattell used factor analysis to examine a list of 4,500 personality descriptors and concluded that a dozen or more unique personality factors existed, although later reanalysis of Cattell's data by others found only five reliable factors (Goldberg, 1993). In the years that followed, others employed increasingly sophisticated factor analytic methods to examine both lexically and empirically derived personality descriptors. Although debates in the 1960s and 1970s over whether behavior was determined by consistent personality traits or by situational demands delayed the widespread acceptance of trait theory, evidence for consistency of personality became so great that few now question the validity of trait theory (Funder, 2001).

Five-Factor Model

As a result of the work of the last two decades, a model containing five personality factors, which has come to be called the "five-factor model" (FFM) or "Big Five," has emerged and moved to a position of wide, although not universal, acceptance. Some researchers assert that there are fewer (Digman, 1997; Eysenck, 1992) or greater (Cattell & Krug, 1986; Guilford, 1975) than five basic personality factors. The premise of the FFM is that all descriptors of human personality can be categorized into five basic clusters or factors (McAdams, 2001). Proponents of the FFM do not claim that humans have only five personality traits. Rather, they claim that the FFM represents the uppermost level of a hierarchy of personality descriptors, with lower levels addressing more narrowly defined characteristics. The FFM provides a

common language for describing human behavior and has proven to be a useful tool for eliminating the confusion of personality descriptors that plagued personality research in earlier years.

A large number of cross-cultural studies have demonstrated that much of the five-factor model can be replicated in very diverse cultures. Although not every factor is found in every culture and in some cases additional factors are found, the five-factor structure has been confirmed in countries as varied as Estonia (Kallasmaa, Allik, Realo, & McCrae, 2000); Turkey (Goldberg & Somer, 2000); the Netherlands, United States, and Germany (Hofstee, Kiers, de Raad, Goldberg, & et al., 1997); and others.

In addition to cross-cultural applicability, the five-factor model shows remarkable stability over time. This should not be surprising since personality traits are intended to be descriptors of consistent patterns of behavior. Costa and McCrae, reviewing a number of longitudinal studies of adult personality stability ranging from 3 to 30 years in length, found that the median test-retest correlation on various personality measures was about .65, and that when corrected for error, the "...stability coefficients usually exceed .90" (Costa & McCrae, 1994, p. 32). Personality does change, but the greatest change occurs in the pre-adult years. Costa and McCrae (1994) conclude that personality attains full maturity and stability in the late 20s. Studies examining personality change in the late adolescent to young adult period found somewhat lower stability coefficients in the range of .53 to .70 across the four undergraduate years of college (Robins, Fraley, Roberts, & Trzesniewski, 2001)

and .43 to .67 for subjects in the age range of 18 to 26 (B. W. Roberts, Caspi, & Moffitt, 2001). These lower stability coefficients indicate a higher rate of personality change during the college and immediate post-college years.

Technically, there are two variations of the five-factor model, one from the lexical line of research (Goldberg, 1990) and the other from the questionnaire research of McCrae and Costa (1985; 1987). The factor names (Table 1) used in these two variations differ somewhat as does the content of the factor constructs. In terms of the factor constructs, factors I and II appear to be similar in nature, but they do differ in some of their sub-factor loadings. Factors III and IV are identical, although the names used for factor IV are from opposite ends of the factor continuum. Factor V has different, although related, conceptualizations in the two model variations (Goldberg, 1993).

Table 1

Factor Name Comparison for the Two Variations of the Five-Factor Model

Factor Number	Goldberg (lexical approach)	McCrae & Costa (questionnaire approach)
I	Surgency	Extraversion
II	Agreeableness	Agreeableness
III	Conscientiousness	Conscientiousness
IV	Emotional Stability	Neuroticism
V	Intellect/Imagination	Openness to Experience

Despite modest differences in the content of the factor constructs of three of the factors, the literature tends to treat the lexical and questionnaire variations of the FFM as the same. There appears to be a preference for the factor names used by McCrae and Costa, perhaps because of the prolific

research of these two individuals and the widespread use of their *Revised NEO Personality Inventory* (NEO PI-R), a self-report FFM instrument that is the most commonly used tool for assessing personality according to the FFM (McAdams, 2001).

Leadership Prediction and the Five-Factor Model

Few studies have directly examined the relationship between the personality dimensions of the FFM and leadership. In fact, I was only able to find two such studies. McDaniel (1992) investigated the relationship of FFM personality dimensions of leaders to their effectiveness in leading organizational change as perceived by self and others. He found that leaders scoring high on Openness and Conscientiousness were rated as being more effective leaders of change. Judge and Bono (2000) examined the relationship between NEO PI-R ratings and transformational leadership, as measured by test data and ratings by both subordinates and supervisors, of over 200 community leaders. Judge and Bono found that the FFM traits of Agreeableness, Extraversion, and Openness to Experience were positively correlated to transformational leadership, although the effect of Openness to Experience became non-significant when the effects of other factors were controlled.

Although not a direct examination of the relationship between the FFM and leadership, McCrae (1987) investigated the relationship between Openness to Experience and creativity and found that the Openness dimension was strongly related to creative ability and creative accomplishments. In a

similar study, King, McKee Walker, and Broyles (1996) examined the relationships between the factors of the FFM and two measures of creativity, verbal creativity and creative accomplishments, and found significant positive correlations between Extraversion and verbal creativity ($r = .26, p < .05$), Openness and verbal creativity ($r = .38, p < .01$), and Openness and creative accomplishments ($r = .47, p < .01$). They also found a negative correlation between Agreeableness and creative accomplishments ($r = -.23, p < .05$). However, a regression equation containing all five personality factors revealed that only Openness to Experience made a significant contribution to the prediction of creativity. In a study comparing thinking styles and the FFM dimensions of personality, Zhang and Huang (2001) also found that the factors of Extraversion and Openness to Experience were significantly positively related to creativity. However, directly opposite the findings of King et al. (1996), Zhang and Huang (2001) found a significant positive correlation between Agreeableness and creativity. As discussed earlier, creativity is arguably an important quality of leaders who must perform discretionary problem solving and vision setting functions under conditions of ambiguity and complexity for their organizations. In a review of studies that examined the relationship of Openness to a number of social variables, McCrae (1996) also reported that high Openness was significantly related to leading successful organizational change and that low Openness was related to authoritarianism.

Despite the shortage of studies directly examining the relationship between the FFM and leadership, there is strong belief (Hogan et al., 1994;

Quirk & Fandt, 2000) and substantial evidence that the five-factor traits are related to important aspects of leadership. Stogdill's 1970 review of leadership traits (Stogdill, 1974) identified several traits that readily map to FFM dimensions. Stogdill's traits of responsibility, task completion, and persistence in pursuit of goals are central elements of Conscientiousness; vigor is related to Extraversion; venturesomeness is a component of Openness to Experience; and self-confidence and sense of personal identity represent qualities found at the positive end of the Neuroticism dimension.

Several studies have examined the factor structure of the *California Psychological Inventory* (Deniston & Ramanaiah, 1993; Fleenor & Eastman, 1997), and the *Myers-Briggs Type Indicator* (McCrae & Costa, 1989), and found the five-factor structure extant within these instruments. Gough (1990) and Hammerschmidt & Jennings (1992) used the *California Psychological Inventory* to test for personality correlates of effective leadership and Fitzgerald (1997), McCaulley (1990), and Roush (1992) used the *Myers-Briggs Type Indicator* for the same purpose. These inventories have been extensively used in studies of the personality correlates of leadership and found to be sound predictors of leadership effectiveness. It seems reasonable that if the FFM accounts for the factor structure of these instruments that it should also share their ability to predict leadership performance.

Conclusion

Effective leadership is important to society, organizations, and individuals, and leadership development is an important mission objective of many

institutions of higher education. Research strongly supports the conclusion that certain cognitive and personality attributes serve as the foundation upon which leadership performance is based. Despite this evidence, few studies exist which examine these attributes in combination. Of those studies that do examine the influence of both cognitive and personality attributes, a substantial number employ cognitive, personality, or leadership assessment instruments that are not convincingly validated.

Evidence also indicates that personality becomes relatively fixed in the late 20s and is unlikely to change without a significant emotional commitment and effort. Therefore, college may offer the last and best opportunity for systematic leadership development. The purposeful development of student cognitive attributes and personality has been part of the business of higher education for hundreds of years. Institutions of higher education exist in large part for the purpose of promoting individual change and growth that will enable their graduates to not only succeed in their careers, but also to be effective as leaders in society. However, if colleges and universities are to develop and implement comprehensive and coherent programs of leadership development aimed at the foundations of cognition and personality, they must first understand how these attributes combine and interact with environmental variables to determine leadership success. This understanding can then guide the development of curricular and extra-curricular interventions that will result in the greatest developmental gains.

CHAPTER III

METHODOLOGY

This correlational study sought to answer the question: how are personality and critical thinking ability related to the leadership performance of college student leaders? The purpose of the study was confirmatory. It employed path analysis and structural equation modeling to confirm previously identified relationships between personality factors, critical thinking ability, and leadership performance.

Sample

Participants

The subjects of this study were college students who were the formally designated or elected leaders of institutionally recognized student organizations at one of 13 colleges and universities in North Carolina and Virginia. Personality, critical thinking ability, and leadership performance data were gathered from the student leaders.

Although it is true that virtually any college student may, at times, act as an informal or emergent leader, it was not feasible to select subjects randomly from the general student body because the selected student may not have acted as a leader in any significant or memorable capacity. Restricting the sample to formal student leaders increased the likelihood that each subject had displayed sufficient leadership behavior to permit an adequate recollection and rating of the individual's leadership performance.

In addition to student leaders, who were the focal subjects in this study, leadership performance data were gathered from members of the organizations that the student leaders led. These participants are referred to as student observers or simply as observers.

Selection

Potential student leader participants were identified by obtaining rosters of institutionally recognized student organizations, their leaders, and leader contact information from institutional websites or from the Student Affairs office or equivalent. An electronic mail message (email; Appendix A) explaining the purpose of the study, its voluntary nature, and soliciting participation was sent to each of the student leaders. This email contained a unique user identification and password that permitted the individual to login to the study website and complete all study forms and instruments. The student was first required to read an informed consent disclosure (Appendix B) and indicate a willingness to participate in the study before being allowed to continue to the research forms and instruments. Included in the research forms and instruments was a demographic questionnaire (Appendix C) which asked for a number of items of information relevant to both the research questions of the study and the screening of participants for inclusion in the study. Particularly relevant to the screening of participants were questions pertaining to the individual's age and tenure as the primary leader of the specified student organization. To ensure that participants were in the traditional undergraduate age range and that they had sufficient leadership experience to

enable them to accurately complete the leadership assessment instrument, only participants who were 26 years old or younger and who had filled their student leadership position for one month or more were retained in the study.

Student observer participants were identified by asking each student leader to nominate and provide contact information for three members of his or her organization who knew the leader well enough to evaluate the leadership behavior of the student leader. Student leaders were asked to nominate one organizational member who was easy to lead, one who was average in difficulty to lead, and one who was difficult to lead. Nominated observers were contacted by email. This email was similar in content to the email message previously sent to student leaders (Appendix D). The email provided each nominated observer with a unique user identification and password and asked the nominated observer to visit the study website. As for the student leaders, the study website provided an informed consent disclosure and permitted access to the research instruments to only those who consented to participate. The research instruments for observers consisted only of a demographic questionnaire (Appendix E) and the rater version of the leadership assessment questionnaire.

Number Required

The required sample size was driven by the desired level of statistical power, the characteristics of the data, and the nature of structural equation modeling, the statistical procedure used to evaluate the hypothesized leadership models.

The determination of required sample size for structural equation models depends upon the number of degrees of freedom in the model and the expected closeness of the model fit. In structural equation modeling, the number of degrees of freedom is determined by the formula $df = 0.5(p)(p+1) - q$, where p is the number of observed variables and q is the number of parameters in the model. Examination of two basic models were planned for this study, one with 7 variables and 14 parameters and the other with 8 variables and 18 parameters. For the first model then, $df = 14$ and for the second, $df = 18$. MacCallum, Browne, and Sugawara (1996, p. 144) indicate that to achieve statistical power of .80 for $\alpha = .05$ under conditions of close fit and $df = 14$, a minimum sample size of 585 subjects is required. The sample size requirement increases to 598 subjects under conditions of not-close fit. For $df = 18$, sample size requirements are 472 subjects for close fit and 508 for not-close fit conditions. Other rules of thumb for estimating minimum sample size are much less demanding than this. Boomsma (as cited in Tabachnick & Fidell, 2001) suggests that small to medium models may be examined with samples as small as 200. Tabachnick and Fidell (2001) themselves suggest that given large effect size and normally distributed variables, as few as 10 subjects per model parameter may suffice. Klem (1995) offers a similar rule of thumb, suggesting that 5-10 subjects are needed for each parameter, including residuals. According to Klem's calculation, a sample size of 70 to 180 subjects would suffice for the basic models examined in this study.

Although this study hypothesized two basic models of leadership, the dependent variable, leadership performance, was measured in several ways. This resulted in multiple variations of the two basic models with the independent variables remaining constant but measures of leadership performance differing. The mean number of degrees of freedom for these variations was 63, which required approximately 180 subjects according to MacCallum, Browne, and Sugawara (1996, p. 144) to achieve statistical power of .80 for $\alpha = .05$ under conditions of close fit.

Instrumentation

Three self-report assessment instruments, the *Watson-Glaser Critical Thinking Appraisal* (WGCTA), *Multifactor Leadership Questionnaire* (MLQ), and *Mini-Markers* personality inventory were used in this study. The *Multifactor Leadership Questionnaire* was used in both its self-report and rater forms. Both the WGCTA and MLQ are commercial instruments that have extensive histories of use in research and are widely considered to be exemplary for their categories. The *Mini-Markers* inventory has been less extensively used, but it possesses a robust factor structure and very good psychometric characteristics. In addition to these three instruments, demographic information was collected from both student leaders and observers via short questionnaires.

Mini-Markers Personality Inventory

The *Mini-Markers* personality inventory is a 40 item instrument designed to measure the five broad personality domains postulated by the five-factor

model (FFM) of personality: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect or Openness. Saucier (1994) derived *Mini-Markers* from Goldberg's (1992) 100 adjective markers used to measure the FFM dimensions. *Mini-Markers* was designed to be faster to administer and to eliminate some of the more difficult trait adjectives used in Goldberg's set of 100 personality markers.

The 40 items of the *Mini-Markers* inventory consist of self-descriptive adjectives (personal traits) rated by the respondent on a nine-point Likert scale ranging from "extremely inaccurate" to "extremely accurate." Eight adjectives are used to determine the rating for each of the five personality factors. An example of one instrument item, as presented in the online adaptation of the instrument, is shown in Figure 1. Factor ratings are calculated as the mean score of the eight items comprising each factor

Imaginative

<i>Inaccurate</i>				?	<i>Accurate</i>			
<u><i>Extremely</i></u>	<u><i>Very</i></u>	<u><i>Moderately</i></u>	<u><i>Slightly</i></u>		<u><i>Slightly</i></u>	<u><i>Moderately</i></u>	<u><i>Very</i></u>	<u><i>Extremely</i></u>
○	○	○	○	○	○	○	○	○

Figure 1. Example of a *Mini-Markers* instrument item.

Instructions for completing the *Mini-Markers* instrument are clear and simple. Subjects are told to indicate how accurately each of the trait terms describes themselves using the nine-point Likert scale. The subjects are also instructed to consider how they currently are, not as they wish to be, and to compare themselves to other persons of the same sex and approximate age. Fewer than 10 minutes are required to complete the instrument.

Although test-retest reliability data are not available for *Mini-Markers*, the instrument does demonstrate adequate internal consistency. In a sample of 320 college students responding to *Mini-Markers* as a self-report instrument, and a second group consisting of 316 of the same students who used *Mini-Markers* to describe another person whom they knew well and liked, internal consistency (coefficient alpha) for was found to range from .76 to .86 for the five personality factors. This compares favorably to the internal consistency (coefficient alpha) for Goldberg's (1992) 100-item instrument which ranged from .83 to .91 for the five personality factors using the same two subject samples.

The validity of *Mini-Markers* is derived from its ability to accurately reproduce the five factors produced by Goldberg's 100-item instrument. The five personality factors produced by *Mini-Markers* correlated from .92 to .96 with their corresponding factors from the Goldberg instrument (Saucier, 1994). The validity of the Goldberg instrument was itself demonstrated by correlations with the *NEO-PI* (Costa & McCrae, 1985), the most widely used instrument for assessing the personality dimensions of the FFM. Correlations between the five personality factors reported by the Goldberg instrument and their corresponding factors from the *NEO-PI* ranged from $|.46$ to $.69|$ (Goldberg, 1992). The 100-item Goldberg instrument's factors were also correlated with similar, but not identical factors from the *Hogan Personality Inventory*, yielding correlations in the range of .31 to .62.

Watson-Glaser Critical Thinking Appraisal

The *Watson-Glaser Critical Thinking Appraisal* (WGCTA) is an 80-item self-report inventory available in two equivalent forms A and B. Form B was used exclusively in this study. The WGCTA requires approximately 40 minutes to complete. Raw scores, consisting of the total number of questions answered correctly, are converted to percentile scores using normative data provided in the test manual. Instructions for completing the WGCTA are easily understood, and a ninth-grade reading level is required (Watson & Glaser, 1980).

The WGCTA contains five subtests, each consisting of 16 questions and designed to assess a different component of critical thinking, described by the WGCTA manual (Watson & Glaser, 1980, p. 2) as follows:

- Test 1. **Inference.** Discriminating among degrees of truth or falsity of inferences drawn from given data.
- Test 2. **Recognition of Assumptions.** Recognizing unstated assumptions or presuppositions in given statements or assertions.
- Test 3. **Deduction.** Determining whether certain conclusions necessarily follow from information in given statements or premises.
- Test 4. **Interpretation.** Weighing evidence and deciding if generalizations or conclusions based on the given data are warranted.
- Test 5. **Evaluation of Arguments.** Distinguishing between arguments that are strong and relevant and those that are weak or irrelevant to a particular question at issue.

The *Inference* subtest presents descriptions of three events or situations that the test taker is to consider to be factual, and statements of several possible inferences that one might draw from each factual description. There are a total of 16 inferential statements in the subtest. For each inferential statement, the test taker is to rate the statement as definitely true, probably true, lacking sufficient data to determine truth or falsity, probably false, or definitely false.

The *Recognition of Assumptions* subtest presents several statements, each followed by two to four proposed assumptions. There are a total of 16 proposed assumptions in the subtest. The test taker must consider each assumption and indicate whether a person making the related statement would also be making the assumption. Each assumption is then rated as “assumption made” or “assumption not made.”

In the *Deduction* subtest, the test taker is presented with several premises that are to be considered to be true. Each premise is followed by two to four conclusions that one might deduce from the premise. There are a total of 16 conclusions in the subtest. The test taker must consider each conclusion and indicate whether it necessarily follows from the premise given or is not a necessary conclusion of the premise.

The *Interpretation* subtest presents several short paragraphs that the test taker is to consider to be true. Each paragraph is followed by two or three proposed conclusions that one might draw from the paragraph. There are a total of 16 proposed conclusions. The test taker must consider each proposed

conclusion and its related paragraph to determine if the conclusion logically follows from the information given in the paragraph. The test taker indicates that the conclusion follows if it does so “beyond a reasonable doubt” or indicates that the conclusion does not follow if it does not pass the reasonable doubt standard.

The *Evaluation of Arguments* subtest presents five questions and several potential arguments that might be given to support either a “Yes” or “No” response to each question. There are a total of 16 potential arguments. The test taker must indicate whether each argument is either a strong argument or a weak argument. Strong arguments are defined in the test as “..both important and directly related to the question.”

Although the WGCTA consists of five subtests, the instrument is scored to yield a single composite critical thinking score. The authors discourage attempts to use subtest scores since each subtest employs relatively few items resulting in inadequate subtest reliability.

The WGCTA manual provides adequate normative data for high school students, college students, and several occupational groups. Reliability and validity of the WGCTA also appear adequate, based on statistics reported by the test manual.

Internal consistency, measured as split-half reliability coefficients range from .69 to .85. Test-retest reliability over a three-month time period in a college student sample ($N = 96$) was found to be .73. Alternate-form reliability

for Forms A and B was determined to be .75 for a group of 228 twelfth grade high school students.

The validity of the WGCTA has been assessed in several ways. Students who have undergone educational experiences, intended to improve critical thinking, have shown higher average performance on the WGCTA than those who have not had such experiences. Performance on the WGCTA has also been shown to correlate strongly with scores on several measures of academic achievement and intelligence, including the *Otis-Lennon Mental Ability Test*, *Scholastic Aptitude Test* (verbal), *American College Test* (composite score), *California Achievement Tests* (reading), *Wechsler Adult Intelligence Scale* (verbal), and *Miller Analogies Test*. Correlation coefficients between the WGCTA (Forms A and B as well as the earlier Forms Am, Ym, and Zm) and these measures range from approximately .55 to .81.

Multifactor Leadership Questionnaire

The *Multifactor Leadership Questionnaire* (MLQ) Form 5X is a 45-item inventory available in both a self-report version (the “Leader Form”) and an observer rating version (the “Rater Form”) (Bass & Avolio, 2000). The MLQ is designed to assess self- or other-reported leadership performance using a “full-range” model of leadership which ranges from ineffective laissez-faire leadership to highly effective transformational leadership. In addition to assessing leadership behavior according to the full-range model, the MLQ provides measures of the five component factors of transformational leadership, the three component factors of transactional leadership, and

several leadership outcome measures that assess the leader's ability to elicit extra effort from followers, ability to satisfy followers, and effectiveness in performing several specific leader functions.

The 45 test items of the MLQ consist of statements about one's own leadership behavior, for the Leader Form, or statements about the observed leader's behavior, for the Rater Form. The content of the items in the two forms are identical except that Leader Form items are phrased in the first person and Rater Form items are phrased in the third person. Both forms of the MLQ use a five-point Likert scale to describe the frequency with which the behavior is exhibited. The verbal anchors for the rating scale are "Not at all," "Once in a while," "Sometimes," "Fairly often," and "Frequently if not always." Each of the verbal anchors has an assigned point value ranging from zero points for "Not at all" to four points for "Frequently if not always." Results of the MLQ are reported as the average score for the items comprising each of the instrument's scales.

The MLQ manual reports the mean and standard deviation for each of the instrument's 12 scales as well as for each test item. These data are reported for nine samples drawn from American and Taiwanese undergraduates, a U.S. Government research agency, the U.S. Army, a Scottish gas firm, three U.S. business firms, and a U.S. nursing school (combined $N = 2,145$). The Rater Form of the MLQ was used in all of these cases.

Internal consistency for the 12 MLQ scales, based on the aggregate sample ($N = 2,145$) described above, is strong, ranging from .74 to .94 ($Mdn = .885$). Test-retest reliability is not reported in the MLQ manual.

The validity of the MLQ is inadequately examined in the test manual despite the fact that the MLQ, in its various versions, has long been the most widely used instrument for the assessment of transactional and transformational leadership. The manual address issues of construct, convergent, and discriminant validities through an extensive discussion of two series of confirmatory factor analyses (CFA) performed several years apart. The first analysis sought to validate the structure of the full-range of leadership model and to examine the convergent and discriminant validities of the instrument. Strong correlations between the subscales comprising transformational leadership and between the subscales of passive leadership (i.e. laissez-faire and passive management by exception) provided some support for convergent validity. Low correlations between transformational leadership scales and passive leadership scales provided evidence for discriminant validity. However, correlations between transformational and transactional leadership scales were problematic in that they did not conform to the expectations of the full range of leadership model. Results of these analyses were used to refine the items of the MLQ so that inappropriate inter-scale correlations in the MLQ 5X were reduced. The second series of CFAs was designed to test a baseline six-factor model and eight alternative factor structures that might underlie the MLQ 5X. This analysis found that the six-

factor baseline model produced the best fit and provided support for the construct validity of the MLQ 5X. The MLQ test manual provides no other evidence for the construct validity of the instrument. A more recent examination of the MLQ factor structure by Antonakis, Avolio, and Sivasubramaniam (2003) offered support for the validity of the full nine-factor structure in which each of the nine leadership behavior and attribution scales of the instrument comprised one factor. These authors argued that past inabilities to replicate the theoretical factor structure of the MLQ may have resulted from the influence of context. Using homogenous samples and controlling for the contextual factors of environmental risk, leader–follower gender, and leader hierarchical level, Antonakis et al. found support for the nine-factor model.

Research Hypotheses

The goals of this study were confirmatory. It tested two hypothesized models of leadership that were based on a synthesis of previous leadership research.

A large number of leadership studies have examined the relationships between the personality constructs of the five-factor model of personality and various measures and dimensions of leadership. In a comprehensive meta-analysis of 73 independent samples from 60 studies, Judge, Bono, Ilies, and Gerhardt (2002) found positive correlations between leadership and the FFM traits of Extraversion, Agreeableness, Conscientiousness, and Openness, and a

negative correlation between leadership and Neuroticism. The same pattern of correlations was also found by Milan, Bourne, Zazanis, and Bartone (2002).

The relationship between critical thinking and related cognitive abilities and leadership has also been the subject of much investigation. This research has provided wide support for a positive correlation between critical thinking and leadership (e.g. Atwater, Dionne, Avolio, Camobreco, & Lau, 1996; Kickul & Neuman, 2000; Lord & Hall, 1992; Mumford, Zaccaro, Harding, Jacobs, & Fleishman, 2000).

Mumford and Connelly (1991) have argued that leadership is positively related to creativity because leadership, like other creative activities, calls for discretionary problem solving. Others have investigated the relationship between creative ability and FFM personality factors. This research has found a consistent positive correlation between the FFM trait of Openness and various measures of leadership (L. A. King et al., 1996; McCrae, 1987; Zhang & Huang, 2001). Critical thinking has also been found to positively correlate with leadership (Gadzella & Penland, 1995).

The personality, critical thinking, and leadership relationships described above were combined to form the path-analytic model shown in Figure 1 below. Annotations on the arrows of the model indicate the predicted direction of the correlation between the connected factors. The structural equation model in Figure 2 modifies the first model by adding creativity as a latent factor. The models in Figures 1 and 2 were posited as hypotheses 1 and 2 respectively.

Expressing previously reported relationships between personality, critical thinking, and leadership performance as a path-analytic or structural equation model not only allowed verification of correlate-pair relationships, but also extended understanding by testing the combined interaction of all model elements.

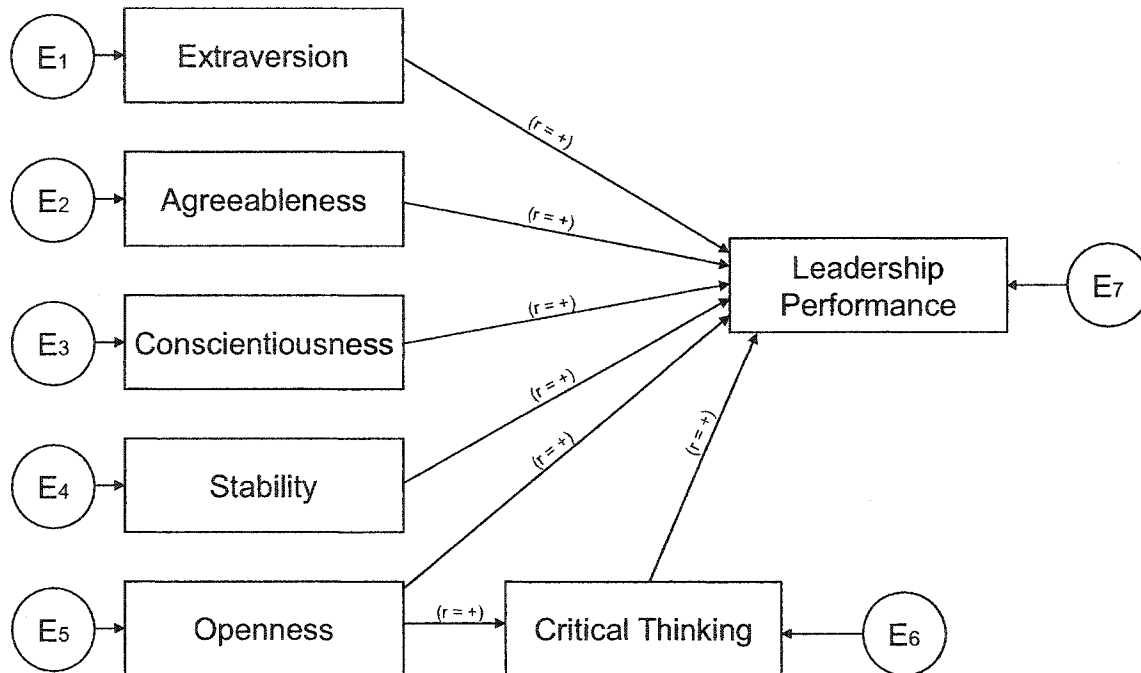


Figure 2. Hypothesized path-analytic model: Influence of five-factor model personality factors and critical thinking ability on leadership performance.

(Hypothesis 1)

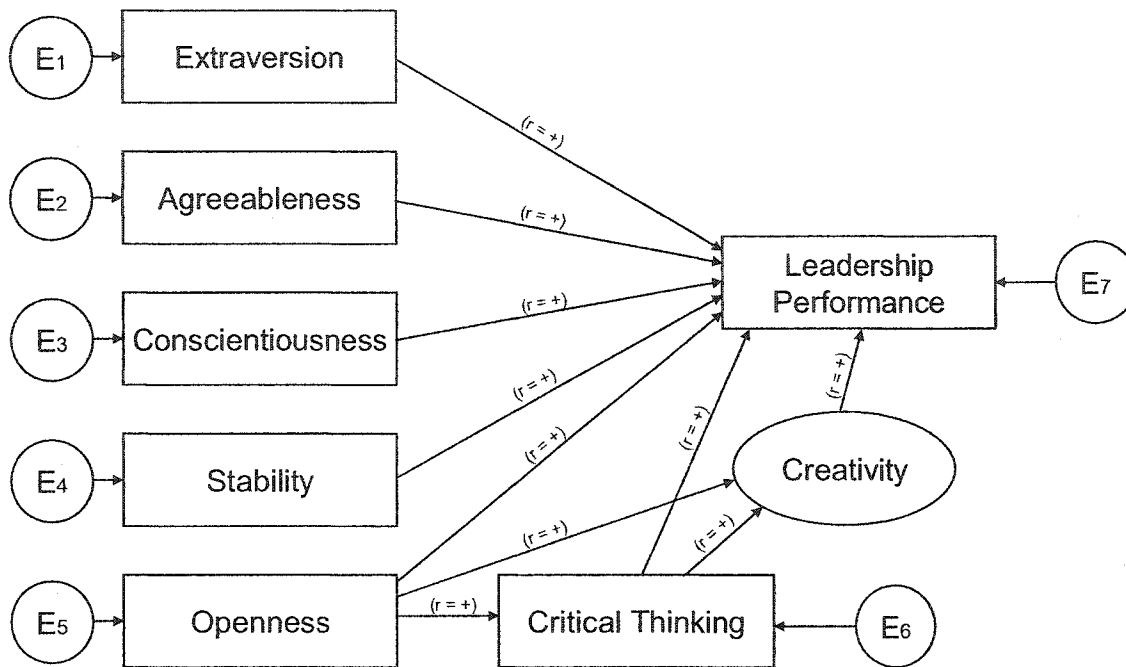


Figure 3. Hypothesized structural equation model: Influence of five-factor model personality factors, critical thinking ability, and creativity on leadership performance. (*Hypothesis 2*)

Procedures

Potential student leader participants were identified by obtaining rosters of institutionally recognized student organizations, their leaders, and leader contact information from institutional websites or from the Student Affairs office or equivalent. Student leaders were contacted by electronic mail to determine if they were willing to participate in the study. To encourage participation, this initial contact email informed the student leaders that a random drawing for three cash prizes would be held at the end of the study. Each participant was entered into the drawing if the participant completed all study requirements and indicated a desire to be entered into the drawing. All subsequent communications and data gathering was accomplished

electronically, via email and the Internet. This greatly accelerated communications and permitted the automated compilation of research data into analyzable electronic form.

Contacting Subjects

An electronic mail message (email; Appendix A) explaining the purpose of the study, its voluntary nature, and soliciting participation was sent to each of the student leaders. This email contained a unique user identification and password that permitted the individual to login to the study website and complete all study forms and instruments. The student was first required to read an informed consent disclosure (Appendix B) and indicate a willingness to participate in the study before being allowed to continue to the research forms and instruments. Included in the research forms and instruments was a demographic questionnaire (Appendix C) which asked for a number of items of information relevant to both the research questions of the study and the screening of participants for inclusion in the study. Particularly relevant to the screening of participants were questions pertaining to the individual's age and tenure as the primary leader of the specified student organization. To ensure that participants were in the traditional undergraduate age range and that they had sufficient leadership experience to enable them to accurately complete the leadership assessment instrument, only participants who were 26 years old or younger and who had filled their student leadership position for one month or more were retained in the study.

Student observer participants were identified by asking each student leader to nominate and provide contact information for three members of his or her organization who knew the leader well enough to evaluate the leadership behavior of the student leader. Student leaders were asked to nominate one organizational member who was easy to lead, one who was average in difficulty to lead, and one who was difficult to lead. Nominated observers were contacted by email. This email was similar in content to the email message previously sent to student leaders (Appendix D).

Administration of Instruments

All study instruments were administered via the Internet using a password-protected website. To help ensure the security of the study instruments and integrity of the collected research data, each participant was issued a unique user identification and password.

Volunteers visited the study website where they were welcomed to the study and provided short descriptions of the purpose of the study and the participant roles of leader and observer (Appendix F). This webpage included a button for student leader participants and a second for observer participants. Volunteers were asked to click on the appropriate button for the role that they had been asked to fulfill. Entry into the study website beyond this initial orientation screen was password controlled. Clicking on one of the two buttons initiated a login dialogue box that prompted the participant for the user identification and password that had been issued to him or her in the initial contact email. User identifications and passwords only allowed participants to

enter the areas of the website appropriate to the roles (leader or observer) that the participants were asked to fulfill.

Once logged in to the secure area of the website the participants were first presented with an informed consent disclosure and response form (Appendix B). The informed consent disclosures for leader and observer were identical except for the list of study instruments that each category of participant was being asked to complete. At the bottom of the informed consent disclosure was a form that allowed the participant to indicate whether or not he or she volunteered to participate in the study. Participants indicated their decision by typing their first and last names in blanks provided and by checking an indicator next to one of two statements reflecting their decision to participate or not. The participants then submitted their decisions by clicking on a submission button. This action caused the participants' user identifications, names, and participation decisions, as well as the date and time to be captured to an electronic file that I was subsequently able to download from the website. Individuals who elected to not participate in the study were sent to an exit webpage thanking them for considering participation in the study.

Individuals who indicated a willingness to participate were sent to a webpage from which they could begin completing the study instruments (Appendices G and H). This webpage encouraged the participants to complete all of the study instruments, briefly explained the nature and approximate completion time for each instrument, and explained the procedures for completing the instruments. The webpage also contained hyperlinks to the

webpages containing each of the study instruments and a button to allow the participant to exit the study website. Selection of the exit button led to a webpage thanking the participant for his or her contribution. For those participants who did not complete all of the study instruments, this webpage also included a reminder asking the participant to remember to return to the study website to complete the remaining instruments.

All study instruments were constructed as electronic forms. The demographic questionnaires for both leader and observer (Appendices C and E) required that the participant type some items of information in form blanks and indicate other information by clicking on selection buttons. Upon completion of the form the participant clicked on a submission button which caused the data from the form, as well as the date and time of the submission and the user identification of the participant, to be recorded to an electronic database for later downloading and analysis.

The *Watson-Glaser Critical Thinking Appraisal* (Form B) and *Multifactor Leadership Questionnaire* were licensed from their respective publishers for reproduction and administration in electronic form. Licensing was not necessary for the public domain *Mini-Markers* personality inventory. All three instruments required participants to click on selection buttons to indicate their responses to the instrument items. The programming of the electronic forms permitted only one selection button to be selected for each instrument item, precluding multiple responses to a single instrument item. In addition, specific numeric values were keyed to each selection button. When the participants

completed and submitted an instrument, the numeric values keyed to the selection buttons chosen for the instrument items were written to a database for later downloading and analysis. This automated system of data gathering saved a great deal of time and prevented errors of scoring and transcription that often affect data gathered via paper instruments.

Data Analysis

Path and Structural Equation Model Analyses

The hypothesized models (Figures 1 and 2) of the relationships between the independent variables of personality, critical thinking ability, and, in the case of hypothesis 2, creativity to the dependent variable of leadership performance were tested using path analysis and structural equation modeling. Several indices were calculated for each model as a means of evaluating how well the model fit the obtained data. The fit indices selected include the Adjusted Goodness of Fit Index (AGFI), Parsimony Goodness of Fit Index (PGFI), Comparative Fit Index (CFI), and Root Mean Square of Error Approximation (RMSEA). The AGFI is a variation of the Goodness of Fit Index (GFI), an index similar in concept to the R^2 of multiple correlation, which is a measure of the variance and covariance in the obtained data that is accounted for by the model. The AGFI modifies the GFI by adjusting for the number of degrees of freedom and penalizing more complex models, making it one of several parsimony fit indices. AGFI values above .90 are considered to be indicative of good fit. The PGFI, also a modification of the GFI, is another parsimony index which imposes a penalty for model complexity as determined

by the number of estimated parameters. Although higher values are better, the PGFI penalty for complexity may result in PGFI values that are appreciably lower than AGFI values. PGFI values are often used when comparing models. The CFI is a comparative fit index which compares the fit of the model to a baseline independence model. The CFI performs effectively even when small sample sizes are used. CFI values above .90 were traditionally viewed as indicative of good fit, although more recent recommendations raise this value to .95 (Byrne, 2001). The RMSEA examines the population fit of the model and, according to Byrne (2001) "has only recently been recognized as one of the most informative criteria in covariance structure modeling" (p. 84). With the RMSEA, lower values are better. Values below .05 are indicative of good fit and values between .08 and .10 are often described as "mediocre" or "marginal" fit. In practice, evaluation of model fit does not depend on a single fit index. Several fit indices that examine different relevant aspects of fit for the models being analyzed should be weighed to reach a conclusion of overall fit.

Factor Analyses

Prior to the confirmatory examination of the hypothesized leadership models, factor analyses of the data gathered with the three instruments used in the study were conducted to verify the factor structure of the dependent and independent variable data.

Examination of SEM Assumptions

Structural equation modeling assumes multivariate normality, the absence of outliers, and the absence of multicollinearity. To determine if these

conditions were met, the full dataset was examined. Moderate univariate skewness was present in most variables, and approximately 4% of cases were found to be multivariate outliers. Collinearity statistics (tolerance and variance inflation factor) and bivariate correlations indicated that the 12 scales of the *Multifactor Leadership Questionnaire* were strongly intercorrelated. This fact was also demonstrated in the factor analysis of the MLQ. However, multicollinearity analysis of MLQ scales using the technique of Belsley, Kuh, and Welsch (1980), as reported by Tabachnick and Fidell (2001, p. 85), revealed no cases of multicollinearity. To test the combined effect of these violations of SEM assumptions, square root data transformations were applied to correct variables for skewness, and multivariate outliers were deleted from the datasets. Each of the path and structural equation models was then analyzed using data from both the original and the transformed and purged datasets. Comparison of the path and SEM solutions produced from the original datasets and the transformed and purged datasets revealed the same patterns of path coefficients, indicating that the moderate violations of SEM assumptions found in the original datasets were not sufficiently large to appreciably degrade the analyses. The original datasets, rather than the transformed and purged datasets, were used in all subsequent analyses to permit retention of the multivariate outlier cases. Outliers were retained because they constituted valid cases, not cases with erroneous values. Retention of outliers also kept statistical power at its maximum.

Multiple Imputation of Missing Data

Path analysis, structural equation modeling, and factor analysis, the primary statistical techniques used in this study, require complete data sets from a substantial number of subjects in order to achieve an adequate level of statistical power. The SPSS 13 implementations of these statistical techniques, which were used in this study, exclude any case that has missing data (listwise deletion). This means that if a participant did not answer even a single item on a study instrument, that participant's entire set of responses for that instrument would be excluded from the analysis. Relatively few missing data elements scattered across the data set for an instrument could result in the loss of a large enough number of cases to produce a substantial loss in statistical power. Additionally, if the missing data are biased, then the exclusion of cases with missing data will result in a remaining sample that is not representative of the full sample (Wayman, 2003). To avoid this loss of statistical power and potential bias in this study, missing data were replaced using a multiple imputation method.

Multiple imputation was used to calculate values for missing data elements because traditional methods such as mean substitution and single imputation linear regression produce undesirable results. Mean substitution replaces all missing values of a variable with the mean of available values in the dataset for the variable. As a consequence, this method has two adverse results. First, it alters the relationship between the variable for which values are being substituted and other variables in the dataset. Second, it reduces

the variance of the variable. Both of these outcomes have an adverse effect on the statistical methods employed in this study. Single imputation linear regression uses available data in the dataset to determine a linear regression equation that is subsequently used to calculate values for missing data elements of the variable. This method has the benefit of preserving the relationship of the variable in question with other variables in the dataset, but it, like the mean substitution method, has the adverse effect of reducing the variance of the variable (Schafer & Graham, 2002).

Multiple imputation both preserves the relationships between variables in the dataset and avoids loss of variance. In conventional multiple imputation, existing data in the dataset are used to calculate values for missing data. The result of this imputation is a complete dataset with no missing data elements. To this point, this method is similar to the single imputation linear regression method described above. However, as the name suggests, in multiple imputation the calculation process is repeated so that several complete datasets are produced. Each time a new dataset is produced, the imputation equation is altered to produce slightly different imputed values. The difference in imputed values between the several complete datasets is tailored to recreate the variability of the original dataset. The resulting multiple datasets are individually analyzed using the statistical procedure appropriate to the purpose of the study, and the results of each of these analyses are then combined according to rules developed by Rubin (1987; Wayman, 2003).

For this study, instead of analyzing multiple imputed datasets and then combining the results, multiple imputed datasets were created and predicted values were drawn from the datasets to replace missing data in a single dataset that was used in subsequent analyses. This process was followed for each of the study instruments. This approach was taken because there exist no "good" rules for combining the post-analysis results of multiple factor analyses (J. C. Wayman, personal communication, February, 2005). The multiple imputation method used in this study has the same advantages of preserving variable relationships and sample variance as does the traditional approach to multiple imputation.

To produce the full dataset for each study instrument, the NORM program (Schafer, 1999) was used to generate 20 full datasets with imputed values replacing missing values. Imputed values were then drawn from the 20 full datasets to replace missing values in the original dataset. All replacement values for each case (participant) in the original dataset that had missing data, were drawn from one of the 20 imputed datasets. The imputed dataset, from which the replacement values were drawn for a given case, was selected in a quasi-random way by dividing the case number by 20 and then selecting the imputed dataset that corresponded to the remainder of the division. If the remainder was zero, dataset number 20 was used. The selected dataset was then entered and the imputed values for the particular case in question were retrieved. See Appendix I for a diagram of this process.

Limitations and Delimitations

Two aspects of the design of this study impose limitations on the utility of the resultant data and conclusions that can be drawn from the data. First, the focal subjects in this study were the formally designated leaders of officially recognized college student organizations (clubs, societies, teams, etc.) from thirteen colleges and universities in Virginia and North Carolina. Restricting the sample to formal student leaders helped ensure that participants actually had leadership experience. Recruiting participants from only Virginia and North Carolina institutions facilitated the process of identifying and contacting potential participants, and may have resulted in a higher rate of participation. However, these participant identification and selection limitations restrict the nature of the population to which results of the study may be confidently extended.

Second, although the broad conceptualization of the two hypothesized leadership models seeks to examine the role of personality and cognitive abilities or power in determining leadership effectiveness, only one type of cognitive ability, critical thinking, was examined in this study. A fuller examination of the hypothesized leadership models would include other measures of cognitive ability, such as multiple intelligences and reflective judgment, that were not pursued in this study due to time and resource constraints. Although, as discussed in chapter II, critical thinking is related to a number of other cognitive abilities, the outcomes of this study were, nonetheless limited by the use of this single measure of cognitive ability.

CHAPTER IV

ANALYSIS OF RESULTS

This chapter presents the results of the study. First is a description of the sample, including response rate, missing data, and demographic questionnaire data. This is followed by descriptions of each of the remaining study instruments. The chapter concludes with the results of the statistical analysis of the two hypothesized models of leadership.

Description of the Sample

The subjects of this study were college students who were the formally designated or elected leaders of institutionally recognized student organizations at 1 of 13 colleges and universities in North Carolina and Virginia. These participants are referred to as student leaders or simply as leaders.

In addition to student leaders, who were the focal subjects in this study, leadership performance data were gathered from members of the organizations that the student leaders led. These participants are referred to as student observers or just as observers.

Response Rate

Email messages soliciting participation in this study were sent to 2,630 leaders. Of this number, 95 produced an automated response indicating that the email was undeliverable, most commonly as the result of a faulty email address. The number of solicitation emails that actually reached their intended recipient is unknown. An additional 75 participants did not meet all

of the criteria for participation in the study and were excluded from the study. Individuals were excluded primarily because they were not undergraduate students, they were above the cut-off age of 26, they were no longer the leader of a student organization, or because they indicated on the informed consent form that they declined to participate. A total of 757 leaders submitted informed consent forms indicating a willingness to participate in the study. Of this number, 616 submitted the demographic questionnaire, 614 submitted the *Mini-Markers* personality inventory, 466 submitted the self-report form of the *Multifactor Leadership Questionnaire*, and 435 submitted the *Watson-Glaser Critical Thinking Appraisal*. Complete sets of all four instruments were submitted by 413 leaders.

Student leader participants were asked to nominate three members of their organization to rate the leader's leadership behavior. Each leader was asked to nominate one member who was easy to lead, one who was average in difficulty to lead, and one who was difficult to lead. A total of 1,317 (of a potential 1,848) observer nominations were received. Email messages soliciting participation in this study were sent to all 1,317 nominated observers. Of this number, 47 produced an automated response indicating that the email was undeliverable. The number of solicitation emails that actually reached their intended recipient is unknown. One participant responded with an email saying that she did not belong to the organization in question. A total of 531 observers submitted informed consent forms indicating a willingness to participate in the study. Of this number, 509 submitted the demographic

questionnaire and 468 submitted the rater form of the *Multifactor Leadership Questionnaire*.

At the end of the data gathering phase, of the 413 leaders who submitted all four leader instruments, 178 had no matching observer data and 235 had matching observer data from one or more observers. Of the 235 leaders with matching observer data, 141 had data from a single observer, 74 had data from two observers, and 20 had data from three observers. When combined, the responses of leaders and observers produced 349 pairs of leader data matched to one set of observer data. Within these 349 combined cases there were 129 observers considered by their organizational leaders to be easy to lead, 120 considered to be average in difficulty to lead, and 100 considered to be difficult to lead. This dataset of 349 combined leader and observer cases, which contained 235 unique leaders, was used in the path analyses and structural equation models that examined observer-reported independent variables. Models that examined only leader-reported independent variables used the full leader dataset containing data from all 413 unique leaders who submitted all four leader instruments.

Missing Data

Responses to the study instruments were largely complete. The *Mini-Markers* personality inventory had 0.32% missing data, the self-report form of the *Multifactor Leadership Questionnaire* had 1.12 % missing data, the rater form of the *Multifactor Leadership Questionnaire* had 1.37% missing data, and the *Watson-Glaser Critical Thinking Appraisal* had 0.53% missing data. To

retain the maximum sample size possible, missing data were replaced in the datasets for *Mini-Markers* and the two forms of the *Multifactor Leadership Questionnaire*. A multiple imputation method of predicting replacement values for missing data, as described in chapter III, was used so that variable relationships and the natural variance of the samples would be preserved. Missing data were not replaced for the *Watson-Glaser Critical Thinking Appraisal* because, as an aptitude test, unanswered questions on this instrument may convey important information about the critical thinking ability of the test taker.

Demographic Information

Leaders

Two samples were used in this study. One contained data for 235 leaders and the second contained data for 413 leaders. The second sample contained all of the leaders from the first. Members of the smaller sample were 61.7% female and 38.3% male, whereas the larger sample was 59.8% female and 40.2% male.

Leader race was distributed in the two samples as shown in Table 2.

Table 2

Distribution of Leader Race

	235 Leader Sample		413 Leader Sample	
	Number	Percentage	Number	Percentage
Asian	24	10.2	38	9.2
Black	11	4.7	32	7.7
Hispanic	6	2.6	12	2.9
Native	2	0.9	4	1.0
White	183	77.9	309	74.8
Other	8	3.4	17	4.1
Missing	1	0.4	1	0.2

Inclusion in the study was restricted to leaders in the age range of 18 to 26 years. This age range was intended to encompass traditional undergraduate ages and to set an upper limit near the point where personality becomes relatively fixed (Costa & McCrae, 1994). The mean leader age was 20.9 years ($SD = 1.23$) for the smaller sample and 21 years ($SD = 1.29$) for the larger.

Leaders were asked to consider how creative they considered themselves to be and to rate their level of creativity on a six-point scale ranging from low creativity to high creativity. No leader selected the first (lowest) level of creativity and fewer than 3% selected the second category. Overall, the mean creativity level selected was 4.47 ($SD = .96$) of a possible 6 points.

The length of time that leaders had led their organizations ranged from 1 to 42 months. The average leader tenure was 10.7 months ($SD = 6.67$).

The organizations themselves ranged in size from 4 to 3,000 members ($Mdn = 30$), although fewer than 5% of the organizations had more than 200 members and fewer than 1% of the organizations had 1,000 or more members. Considering all but the five largest organizations, the mean organizational size was 53 members ($SD = 78.3$).

Leaders rated the activity level of their organizations on a six-point scale ranging from low activity to high activity. Most leaders perceived their organization as being moderately high in its activity level ($Mdn = 5$, $M = 4.36$, $SD = 1.26$).

Leaders were asked to select one category from a list of 11 categories that best described their organization. The distribution of organization types is shown for each of the study samples in Table 3.

Table 3

Distribution of Student Organization Types

	235 Leader Sample		413 Leader Sample	
	Number	Percentage	Number	Percentage
Academic	20	8.5	41	9.9
Arts	18	7.7	33	8.0
Athletics	34	14.5	54	13.1
Government ^a	14	6.0	22	5.3
Greek ^b	19	8.1	44	10.7
Honor ^c	9	3.8	16	3.9
Interest	38	16.2	60	14.5
Media ^d	11	4.7	14	3.4
Religious	20	8.5	27	6.5
Service	20	8.5	36	8.7
Other	32	13.6	62	15.0
Missing	0	0.0	4	1.0

^aGovernment = student government

^bGreek = fraternity or sorority

^cHonor = honor society

^dMedia = college newspapers, magazines, radio, etc.

Observers

A single sample of 349 observers (61.9% female, 38.1% male) participated in this study. Observers had been categorized by their leaders as easy ($N = 129$), average ($N = 120$), or difficult ($N = 100$) to lead.

Unlike leaders, the inclusion of observers in the study was not age-restricted, although 98.9% of observers belonged to the same 18 to 26 year age range to which leaders had been restricted. The ages of observers ranged from 18 to 52 ($M = 20.7$, $SD = 2.8$).

Observer race was distributed as shown in Table 4.

Table 4

Distribution of Observer Race

	Number	Percentage
Asian	35	10.0
Black	15	4.3
Hispanic	8	2.3
Native	2	.6
White	269	77.1
Other	19	5.4
Missing	1	0.3

The demographic questionnaire for observers (Appendix E) asked several questions intended to gather information relevant to the determination of the

observer's ability to report on the leadership performance of the leader. The activity level of the organization was assessed as a gauge of the leader's opportunity to be seen acting as a leader. The observer's own activity level within the organization and the number of months that the observer had been able to observe the leader were assessed as indicators of the observer's opportunity to observe the leadership behaviors of the leader. The observer was also directly asked to estimate his or her ability to judge the leadership performance of the leader. As an additional gauge of exposure to the leader and of possible bias, observers were asked to indicate the level of interaction that they had with their leaders outside of organizational activities. All of these assessments employed a six-point scale with a score of one representing the lowest level of the rating continuum and a score of six representing the highest level. The results for these estimates of the observer's familiarity with the leader and leader performance are summarized in Table 5.

Table 5

Factors Affecting Observer's Ability to Rate Leader's Performance

Question	<i>M</i>	<i>SD</i>
Number of months observer has observed the leader	10.0	7.0
Activity level of the organization ^a	4.3	1.2
Observer's activity level within the organization ^a	5.2	1.0
Self-assessed ability to judge the leader's performance ^a	5.2	0.9
Observer's outside interaction with the leader ^a	4.5	1.5

Note. *N* = 349.

^aAssessed on a six-point scale with 1 = low and 6 = high.

Finally, observers were asked to indicate their perceptions of the leader's success ($M = 4.9$, $SD = 1.1$) in achieving the goals of the organization, and of the leader's level of creativity ($M = 4.5$, $SD = 1.1$). These outcome measures were also assessed on a six-point scale with a score of one representing the lowest level of the rating continuum and a score of six representing the highest level.

Results by Instrument

Mini-Markers

Mini-Markers was administered to leaders as a measure of the factors of the five-factor model of personality. Each of the five personality factors (Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness) is measured by eight instrument items, whose scores are averaged to yield the factor score. Instrument items are self-descriptive adjectives rated on a 1 – 9 scale with 1 indicating that the adjective is "Extremely Inaccurate" and 9 indicating that the adjective is "Extremely Accurate." Half of the items are reverse-keyed.

Descriptive statistics for *Mini-Markers* are given in Table 6 for all 614 leaders who completed *Mini-Markers* and the 235 leader subset used to test the study hypotheses. Normative data are also included for comparison.

Table 6

Descriptive Statistics for Two Mini-Markers Samples

	Sample	Minimum	Maximum	<i>M</i>	<i>SD</i>
Extraversion	1	2.125	8.875	6.379	1.387
	2	2.630	8.880	6.405	1.397
	Norm 1			5.92	1.46
	Norm 2			5.54	1.17
Agreeableness	1	3.750	9.000	7.322	1.001
	2	3.750	9.000	7.285	1.035
	Norm 1			7.18	1.09
	Norm 2			7.10	0.89
Conscientiousness	1	1.875	9.000	6.988	1.134
	2	3.750	8.880	7.105	1.120
	Norm 1			6.24	1.23
	Norm 2			6.36	1.12
Stability	1	1.750	8.875	5.683	1.355
	2	2.130	8.380	5.655	1.300
	Norm 1			4.83	1.20
	Norm 2			4.90	1.08
Openness	1	3.125	9.000	7.056	0.936
	2	4.250	8.880	7.013	0.887
	Norm 1			6.65	1.10
	Norm 2			6.56	1.00

Note. Sample 1, *N* = 614; Sample 2, *N* = 235. Sample 1 subsumes Sample 2.

Normative data are from G. Saucier (personal communication, February 25, 2002). Norm 1, *N* = 360 students at Eastern Illinois University, 1993; Norm 2, *N* = 320 students at University of Oregon, 1978.

Factor analysis was used to determine if the factor structure reported by Saucier (1994) was present in the current data. The number of factors to extract was determined by examination of the scree plot and by the a priori hypothesis that the five-factor structure reported by Saucier would be present.

The scree plot indicated that six factors should be extracted. Both five and six factors were extracted using the Maximum Likelihood method and rotated using Varimax rotation. The five-factor solution (Appendix J) replicated the factor structure reported by Saucier (1994) and accounted for 42.1% of the item variance. The six-factor solution (Appendix K), accounting for 46.2% of the item variance, produced the same first four factors as the five-factor solution, but split the fifth (Openness) factor into two factors that were identifiable as Thought Complexity/Orientation and Mental Productivity. Because these two factors are logical components of the Openness (sometimes also called "Intellect") factor, the simpler and more commonly used five-factor structure was used in the remainder of this study.

Watson-Glaser Critical Thinking Appraisal

The *Watson-Glaser Critical Thinking Appraisal* (WGCTA) was administered to leaders as a measure of critical thinking ability. It is important to note that the WGCTA is an aptitude test with correct and incorrect answers. It is not an inventory of attributes, as are the *Mini-Markers* and *Multifactor Leadership Questionnaire* instruments. The WGCTA contains five subtests, each consisting of 16 questions and designed to assess a different component of critical thinking. The five subtests are: Inference, Recognition of Assumptions, Deduction, Interpretation, and Evaluation of Arguments. Although the WGCTA consists of five subtests, the instrument is scored to yield a single combined critical thinking score that can range from 0 to 80. The authors discourage attempts to use subtest scores.

WGCTA total score ranged from 35 to 77 ($M = 58.71$, $SD = 9.53$) for the total sample of 435 leaders that completed the test, and from 35 to 77 ($M = 59.17$, $SD = 9.37$) for the 235 leaders in the data subset used to test the study hypotheses. The WGCTA test manual (Watson & Glaser, 1980) reports normative statistics, relevant to this study, for a sample of freshmen in four-year colleges ($M = 53.8$, $SD = 9.2$, $N = 824$) and for upper division students in four-year colleges ($M = 59.2$, $SD = 8.4$, $N = 417$).

Factor analysis was used to determine if the five subtests of the WGCTA could be discerned as factors in the current data. The number of factors to extract was determined by examination of the scree plot and by the a priori hypothesis that the five subtests represented factors. The scree plot indicated that three factors should be extracted. Both three and five factors were extracted using the Maximum Likelihood method and rotated using Varimax rotation. Neither the three- nor the five-factor solution produced interpretable factors. The three-factor solution accounted for only 14.3% of the variance and the five-factor solution accounted for 17.7% of the variance. All factors from both solutions contained item loadings from multiple subtests of the WGCTA. The three-factor solution was used to calculate factor scores for the total WGCTA sample ($N = 435$). A second-order factor analysis using Maximum Likelihood extraction was then performed on these three-factor scores. The second-order factor analysis yielded a single factor accounting for 44.9% of the variance. These results support Watson and Glaser's belief that the WGCTA measures a "unidimensional aspect of ability" (1980, p. 13).

Because of this outcome, only the WGCTA total score was used in the remainder of this study.

Multifactor Leadership Questionnaire

The self-report form of the *Multifactor Leadership Questionnaire* (MLQS) was administered to leaders as a measure of their leadership performance. Similarly, observers rated the leader's leadership performance by completing the rater form of the *Multifactor Leadership Questionnaire* (MLQR). Both forms use the same 45 questions except that MLQS questions are written in the first person and MLQR questions are written in the third person.

The *Multifactor Leadership Questionnaire* is designed to yield 12 scales. Nine scales pertain to leadership behavior or attribution and the remaining three describe the outcomes of leadership efforts. The nine leadership behavior or attribution scales are divided into five that assess transformational leadership, three that assess transactional leadership, and one that assesses absent or non-leadership. In this study, several of these individual scales were combined to create broader scales measuring Charisma, Transformational Leadership, Transformational–Contingent Reward, and Passive–Avoidant leadership.

Descriptive statistics for the nine leadership behavior or attribution scales of the MLQS are given in Table 7 for all 466 leaders who completed the MLQS and for the 235 leader subset used to test the study hypotheses. Comparable descriptive statistics for the nine leadership behavior or attribution scales of the MLQR are given in Table 8 for all 468 observers who completed the MLQR

and for the 349 observer subset used to test the study hypotheses. Table 9 provides descriptive statistics for the four combined leadership behavior scales of the MLQS and Table 10 gives comparable statistics for the MLQR.

Descriptive statistics for the three outcome scales are given in Table 11 for the MLQS and Table 12 for the MLQR.

Table 7

Descriptive Statistics for MLQS Individual Leadership Behavior Scales

	Sample	Minimum	Maximum	<i>M</i>	<i>SD</i>
II(A)	1	1.00	4.00	2.974	0.549
	2	1.00	4.00	2.982	0.529
II(B)	1	0.25	4.00	2.879	0.620
	2	1.00	4.00	2.910	0.554
IM	1	1.00	4.00	3.152	0.544
	2	1.25	4.00	3.156	0.515
IS	1	0.75	4.00	2.886	0.554
	2	0.75	4.00	2.873	0.558
IC	1	1.00	4.00	2.987	0.557
	2	1.25	4.00	2.962	0.562
CR	1	1.50	4.00	3.011	0.515
	2	1.50	4.00	3.032	0.525
MBEA	1	0.00	4.00	1.845	0.761
	2	0.25	3.75	1.890	0.726
MBEP	1	0.00	4.00	1.016	0.582
	2	0.00	4.00	1.020	0.587
LF	1	0.00	3.00	0.615	0.510
	2	0.00	3.00	0.598	0.496

Note. Sample 1, *N* = 466; Sample 2, *N* = 235. Sample 1 subsumes Sample 2.

Normative data for the MLQS are not reported in the test manual. II(A) = Idealized Influence (Attributed), II(B) = Idealized Influence (Behavior), IM = Inspirational Motivation, IS = Intellectual Stimulation, IC = Individual

Consideration, CR = Contingent Reward, MBEA = Management by Exception (Active), MBEP = Management by Exception (Passive), LF = Laissez-faire.

Table 8

Descriptive Statistics for MLQR Individual Leadership Behavior Scales

	Sample	Minimum	Maximum	<i>M</i>	<i>SD</i>
II(A)	1	0.00	4.00	2.999	0.849
	2	0.00	4.00	2.957	0.883
	Norm			2.88	0.49
II(B)	1	0.25	4.00	2.733	0.773
	2	0.25	4.00	2.721	0.800
	Norm			2.89	0.49
IM	1	0.00	4.00	3.106	0.764
	2	0.00	4.00	3.062	0.793
	Norm			3.00	0.47
IS	1	0.00	4.00	2.562	0.850
	2	0.00	4.00	2.534	0.872
	Norm			2.88	0.49
IC	1	0.00	4.00	2.589	0.817
	2	0.00	4.00	2.582	0.834
	Norm			3.07	0.50
CR	1	0.00	4.00	2.881	0.779
	2	0.00	4.00	2.848	0.799
	Norm			2.63	0.63
MBEA	1	0.00	4.00	1.766	0.846
	2	0.00	4.00	1.765	0.842
	Norm			2.02	0.60
MBEP	1	0.00	4.00	0.940	0.777
	2	0.00	4.00	0.952	0.774
	Norm			1.12	0.66
LF	1	0.00	3.75	0.499	0.631
	2	0.00	3.75	0.518	0.652
	Norm			–	–

Note. Sample 1, $N = 468$; Sample 2, $N = 349$. Sample 1 subsumes Sample 2.

Normative data is from 162 American college undergraduate students.

Normative data are not available from this sample for LF. II(A) = Idealized

Influence (Attributed), II(B) = Idealized Influence (Behavior), IM = Inspirational

Motivation, IS = Intellectual Stimulation, IC = Individual Consideration, CR =

Contingent Reward, MBEA = Management by Exception (Active), MBEP =

Management by Exception (Passive), LF = Laissez-faire.

Table 9

Descriptive Statistics for MLQS Combined Leadership Behavior Scales

	Sample	Minimum	Maximum	<i>M</i>	<i>SD</i>
CH	1	0.75	4.00	3.002	0.460
	2	1.33	4.00	3.016	0.417
TF	1	1.40	4.00	2.976	0.424
	2	1.50	4.00	2.977	0.400
TFCR	1	1.46	3.96	2.982	0.407
	2	1.54	3.96	2.986	0.388
PA	1	0.00	2.75	0.815	0.466
	2	0.00	2.75	0.809	0.460

Note. Sample 1, $N = 466$; Sample 2, $N = 235$. Sample 1 subsumes Sample 2.

Normative data for the MLQS are not reported in the test manual. CH =

Charisma (mean of II(A), II(B), and IM), TF = Transformational Leadership

Scales Combined (mean of II(A), II(B), IM, IS, and IC), TFCR =

Transformational-Contingent Reward (mean of II(A), II(B), IM, IS, IC, CR), PA =

Passive-Avoidant (mean of MBEP and LF).

Table 10

Descriptive Statistics for MLQR Combined Leadership Behavior Scales

	Sample	Minimum	Maximum	<i>M</i>	<i>SD</i>
CH	1	0.25	4.00	2.946	0.709
	2	0.25	4.00	2.914	0.741
	Norm			2.92	0.48
TF	1	0.40	4.00	2.798	0.695
	2	0.40	4.00	2.771	0.726
	Norm			2.94	0.49
TFCR	1	0.42	4.00	2.812	0.688
	2	0.42	4.00	2.784	0.717
	Norm			2.89	0.51
PA	1	0.00	3.00	0.719	0.629
	2	0.00	3.00	0.735	0.640

Note. Sample 1, *N* = 468; Sample 2, *N* = 349. Sample 1 subsumes Sample 2.

Normative data is from 162 American college undergraduate students.

Normative data are not available from this sample for PA. CH = Charisma

(mean of II(A), II(B), and IM), TF = Transformational Leadership Scales

Combined (mean of II(A), II(B), IM, IS, and IC), TFCR = Transformational-

Contingent Reward (mean of II(A), II(B), IM, IS, IC, CR), PA = Passive-Avoidant

(mean of MBEP and LF).

Table 11

Descriptive Statistics for MLQS Leadership Outcome Scales

	Sample	Minimum	Maximum	<i>M</i>	<i>SD</i>
EE	1	0.00	4.00	2.547	0.639
	2	0.67	4.00	2.543	0.607
EFF	1	0.75	4.00	3.190	0.528
	2	0.75	4.00	3.238	0.473
SAT	1	0.50	4.00	3.180	0.561
	2	0.50	4.00	3.189	0.532

Note. Sample 1, *N* = 466; Sample 2, *N* = 235. Sample 1 subsumes Sample 2.

Normative data for the MLQS are not reported in the test manual. EE = Extra Effort (elicits extra effort from followers), EFF = Effectiveness (effective in meeting follower needs and leading the group), SAT = Satisfaction (leads and works in a satisfying manner).

Table 12

Descriptive Statistics for MLQR Leadership Outcome Scales

	Sample	Minimum	Maximum	<i>M</i>	<i>SD</i>
EE	1	0.00	4.00	2.593	1.028
	2	0.00	4.00	2.565	1.046
	Norm			2.60	1.16
EFF	1	0.00	4.00	3.052	0.799
	2	0.00	4.00	3.035	0.829
	Norm			2.62	0.72
SAT	1	0.00	4.00	3.154	0.924
	2	0.00	4.00	3.122	0.976
	Norm			2.57	1.28

Note. Sample 1, *N* = 468; Sample 2, *N* = 349. Sample 1 subsumes Sample 2.

Normative statistics for EE are from varied government employees, business personnel, and U.S. and Taiwanese college students (*N* = 1,443). Normative statistics for EFF and SAT are from varied government employees, business

personnel, and U.S. nursing students. EE = Extra Effort (elicits extra effort from followers), EFF = Effectiveness (effective in meeting follower needs and leading the group), SAT = Satisfaction (leads and works in a satisfying manner).

Factor analysis was used to examine the factor structure of the MLQS and MLQR responses of leaders and observers, respectively. The number of factors to extract was determined by examination of the scree plots, the previously discussed a priori hypotheses that the instruments produced a six-factor (Avolio et al., 1999) or a nine-factor (Antonakis et al., 2003) structure, and by the interpretability of the factor solutions. The scree plots indicated that three factors should be extracted. Three-, six-, and nine-factor solutions were extracted for both the MLQS and MLQR using the Maximum Likelihood method and rotated using Varimax rotation. The three-factor solution was most interpretable. This solution produced one large factor that was a composite of the five Transformational and the Contingent Reward scales; a second factor that combined the Passive Management by Exception and Laissez-faire scales, replicating the Passive-Avoidant factor recommended by Avolio et al. (1999); and a third factor consisting of the Active Management by Exception scale. This three-factor solution held for both the MLQS (Appendix L) and MLQR (Appendix M) with all items loading on the same scales. The three-factor solution accounted for 26.3% of the item variance for the MLQS and 42.1% of the item variance for the MLQR.

Comparison of MLQ Self and Rater Results

Paired-sample *t* tests were conducted to determine whether leaders and observers rated leadership performance on 12 individual and two combined scales of the *Multifactor Leadership Questionnaire* the same. The results, shown in Table 13, indicate that there were significant differences in leadership ratings on 9 of the 14 MLQ scales.

Table 13

Paired-Sample t Tests for Comparison of MLQS and MLQR Scale Means

Scale	<i>d</i>	<i>t</i>	<i>p</i>
Idealized Influence (Attributed)	0.017	0.322	.747
Idealized Influence (Behavior)	0.196	3.653**	.000
Inspirational Motivation	0.109	2.043*	.042
Intellectual Stimulation	0.321	5.990**	.000
Individual Consideration	0.389	7.267**	.000
Contingent Reward	0.206	3.856**	.000
Management by Exception (Active)	0.101	1.894	.059
Management by Exception (Passive)	0.090	1.681	.094
Laissez-faire	0.111	2.082*	.038
Extra Effort	-0.022	-0.406	.685
Effectiveness	0.227	4.248**	.000
Satisfaction	0.050	0.939	.348
Transformational–Contingent Reward	0.251	4.688**	.000
Passive–Avoidant	0.114	2.126*	.034

Note. $N = 349$, $df = 348$, $p = 2$ -tailed.

* $p < .05$. ** $p < .01$.

Analysis of Hypothesized Leadership Models

Although this study hypothesized two basic models of leadership, the dependent variable, leadership performance, was measured in several ways.

This resulted in multiple variations of the two basic models with the

independent variables remaining constant but measures of leadership performance differing.

The *Multifactor Leadership Questionnaire* contains nine scales measuring dimensions of leadership behaviors and attributes, and three scales measuring the outcomes of the leader's efforts. The demographic questionnaire added another measure of leadership outcome by asking observers to estimate the leader's success in helping the organization achieve its goals. In addition to the individual scales of the MLQ, support was found in this study for a three-factor restructuring of the MLQ, and support has been provided by others for both a six-factor (Avolio et al., 1999) and a nine-factor (Antonakis et al., 2003) restructuring of the MLQ. The number of dependent variables is nearly doubled by the fact that data were obtained for all MLQ scales from both the leader and observer perspectives.

Hypothesis 1

The first hypothesis (see Figure 2) proposes that leadership performance is a function of personality attributes and critical thinking ability. This hypothesis was first tested using the Transformational–Contingent Reward (TFCR) composite score, suggested by the three-factor solution of the MLQ factor analysis, as the outcome measure of the leadership performance dependent variable. The path analysis was completed using TFCR scores from both leaders (Figure 4) and observers (Figure 5). Fit indices for both analyses are summarized in Table 14.

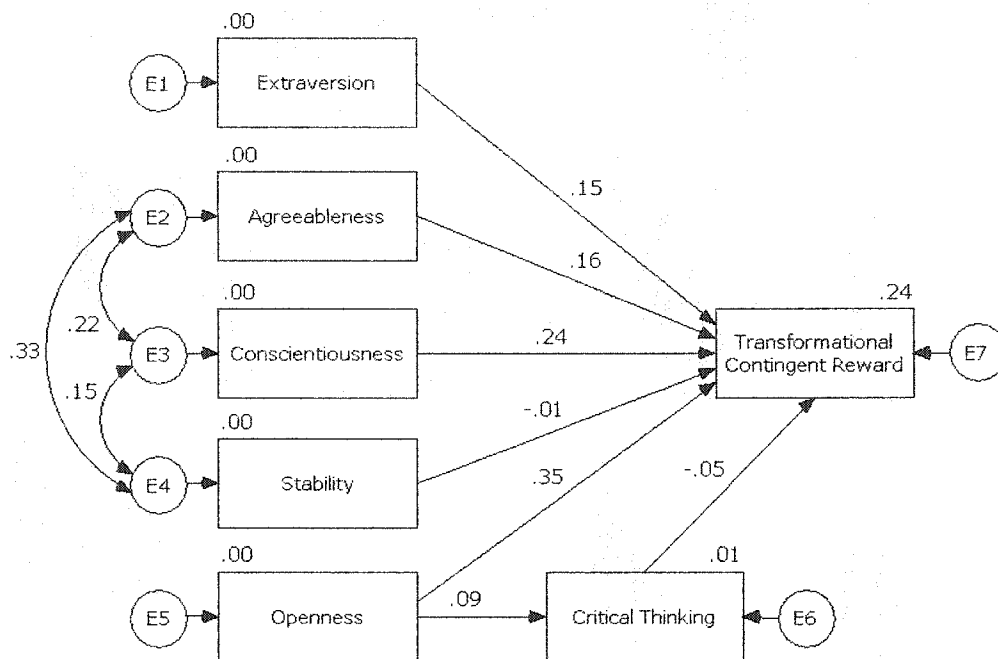


Figure 4. Path analysis of personality and critical thinking ability as predictors of leader TFCR score.

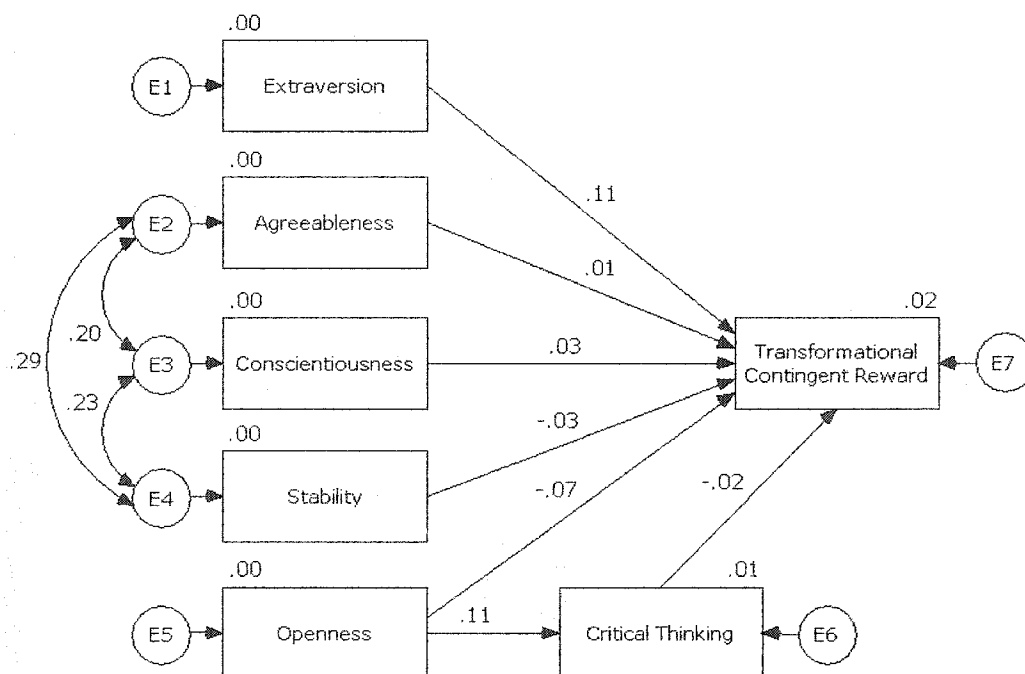


Figure 5. Path analysis of personality and critical thinking ability as predictors of observer TFCR score.

Table 14

Indices of Fit for Path Analysis of Hypothesis 1 Using TFCR Scores

Model	AGFI	PGFI	CFI	RMSEA	Fit Quality
Leader TFCR Scores	.956	.386	.937	.054	Good
Observer TFCR Scores	.970	.388	.947	.029	Good

AGFI = Adjusted Goodness of Fit Index; PGFI = Parsimony Goodness of Fit

Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square of Error

Approximation.

These analyses demonstrated that the model was predictive of the broad TFCR composite score whether it was self-reported from leaders or assessed by observers. Of note are the differences in parameter estimates between the models. Like the paired-sample *t* tests reported earlier, these estimates were further evidence that leaders and observers perceived the leader's leadership behavior and attributes differently.

The basic path model of hypothesis 1 was modified to form a structural equation model with personality and leadership performance as unobserved latent variables. The five observed personality variables from the basic model were used to measure the unobserved personality variable. As before, personality and critical thinking ability constituted the independent variables and leadership performance the dependent variable.

Using the structural equation form, the model was analyzed a second time using the three-factors of the *Multifactor Leadership Questionnaire* obtained in the earlier factor analysis. The analysis was performed for three-factor scores from both leaders (Figure 6) and observers. The solution for the model using

observers' three-factor MLQ scores was not admissible, and is therefore not shown. The error message returned from the AMOS (version 5) program used to conduct these analyses suggested that the model solution was inadmissible because the sample size was too small or the model was incorrect. Fit indices for the solution of the model using leader obtained three factor MLQ scores are summarized in Table 15.

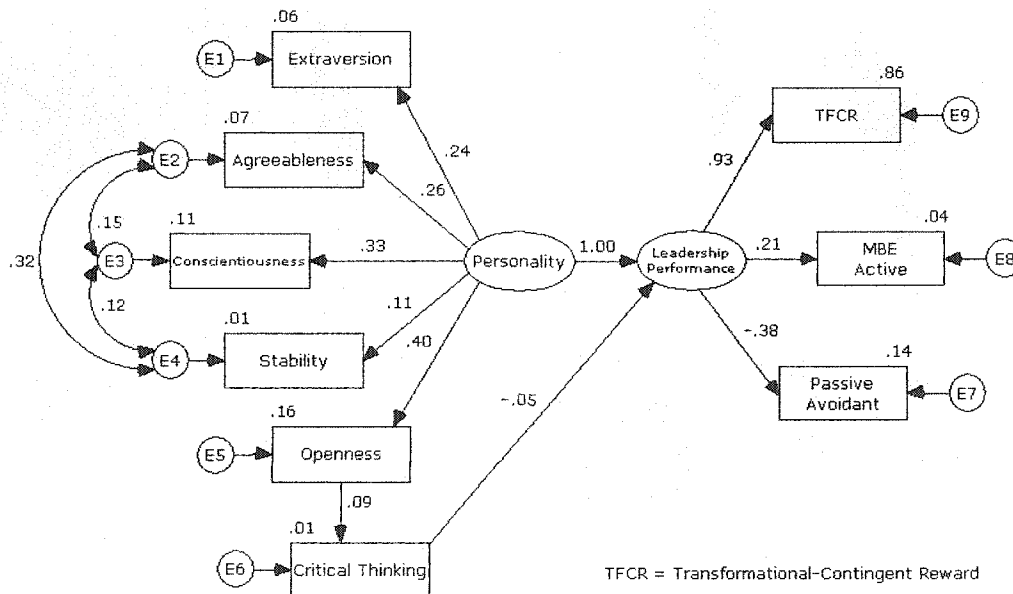


Figure 6. SEM analysis of personality and critical thinking ability as predictors of leaders' three-factor MLQ scores.

Table 15

Indices of Fit for SEM Analysis of Hypothesis 1 Using Three-Factor MLQ Scores

Model	AGFI	PGFI	CFI	RMSEA	Fit Quality
Leader 3-Factor Scores	.930	.493	.850	.071	Poor

AGFI = Adjusted Goodness of Fit Index; PGFI = Parsimony Goodness of Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square of Error Approximation.

This analysis indicated that the model was plausible as a predictor of leadership performance as measured by the three-factor solution of the *Multifactor Leadership Questionnaire*.

The same model was re-run using six-factor MLQ scores as the measure of leadership performance. The results for scores obtained from leaders are shown in Figure 7 and the results for scores obtained from observers are shown in Figure 8. Table 16 summarizes the fit indices for both models.

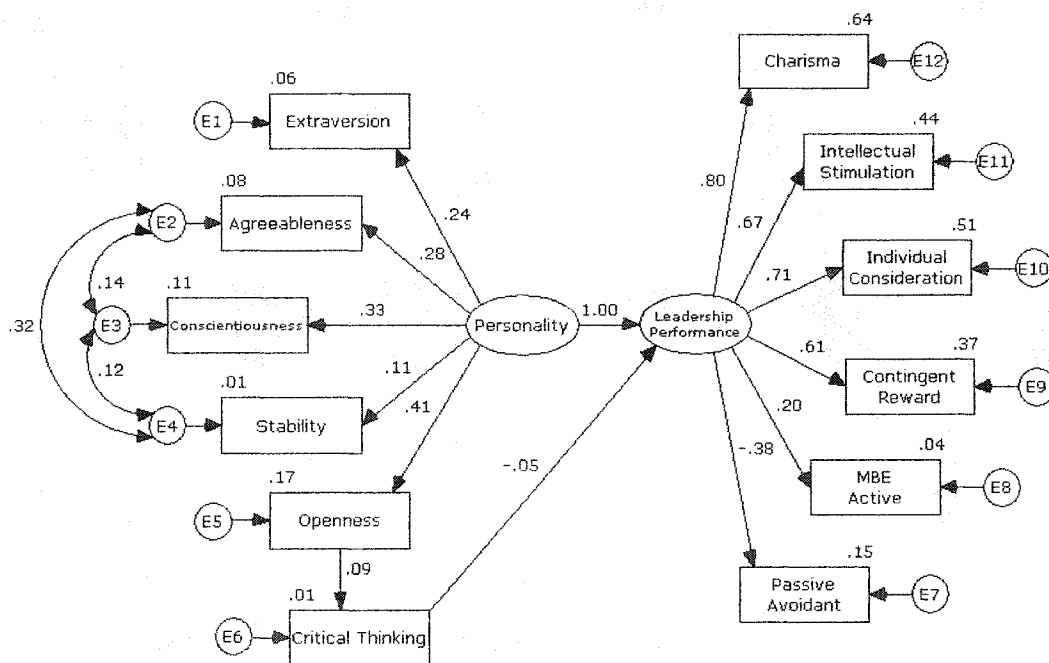


Figure 7. SEM analysis of personality and critical thinking ability as predictors of leaders' six-factor MLQ scores.

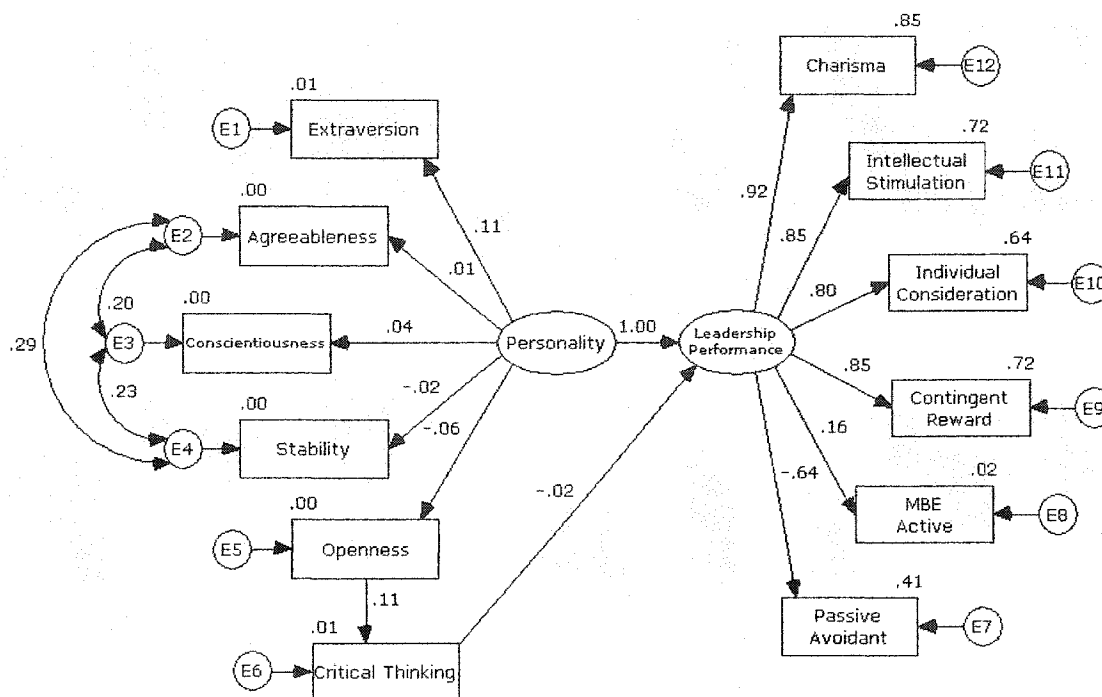


Figure 8. SEM analysis of personality and critical thinking ability as predictors of observers' six-factor MLQ scores.

Table 16

Indices of Fit for SEM Analysis of Hypothesis 1 Using Six-Factor MLQ Scores

Model	AGFI	PGFI	CFI	RMSEA	Fit Quality
Leader 6-Factor Scores	.905	.602	.881	.069	Poor
Observer 6-Factor Scores	.949	.620	.983	.035	Good

AGFI = Adjusted Goodness of Fit Index; PGFI = Parsimony Goodness of Fit

Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square of Error

Approximation.

The fit indices reported in Table 16 demonstrated once again that superior fit was achieved when scores obtained from observers were used as the measure of leadership performance.

The first hypothesis was again tested, this time using all nine scales of the MLQ designed to assess leadership behavior and attributes. The results for nine-factor MLQ scores obtained from leaders are shown in Figure 9, and the results for observer scores are shown in Figure 10. Fit indices for both analyses are given in Table 17.

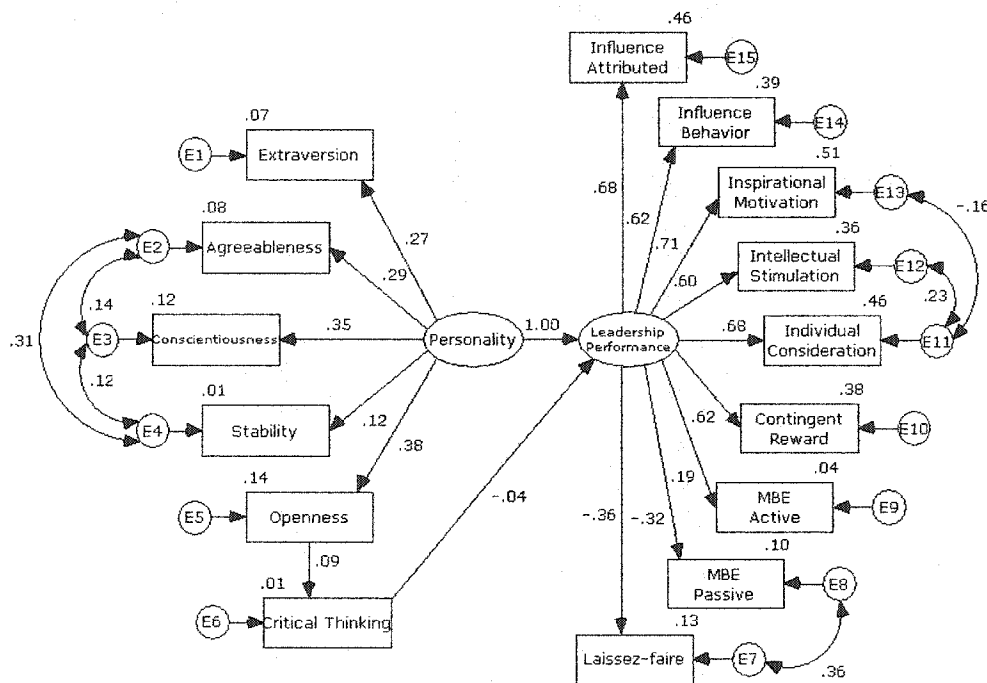


Figure 9. SEM analysis of personality and critical thinking ability as predictors of leaders' nine-factor MLQ scores.

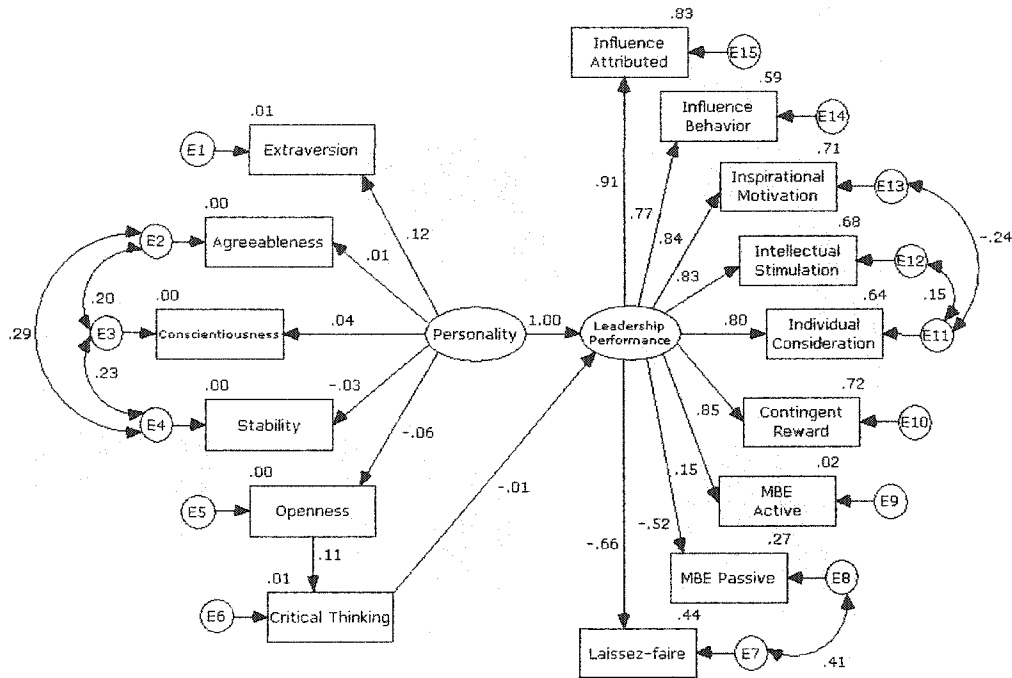


Figure 10. SEM analysis of personality and critical thinking ability as predictors of observers' nine-factor MLQ scores.

Table 17

Indices of Fit for SEM Analysis of Hypothesis 1 Using Nine-Factor MLQ Scores

Model	AGFI	PGFI	CFI	RMSEA	Fit Quality
Leader 9-Factor Scores	.893	.641	.881	.065	Poor
Observer 9-Factor Scores	.922	.654	.965	.050	Good

AGFI = Adjusted Goodness of Fit Index; PGFI = Parsimony Goodness of Fit

Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square of Error

Approximation.

As Table 17 shows, the hypothesis 1 model was also supported when leadership performance was measured using all nine of the MLQ leadership behavior and attribution scales. As with all previous analyses, leadership performance data obtained from observers produced superior model fit. Considering all four behavior and attribution measures of leadership

performance, the best model fit for the first hypothesized model was obtained from observer rated three-factor MLQ scores.

As a final assessment of the first hypothesized model, the analysis was repeated using the three outcomes measures (Effectiveness, Extra Effort, and Satisfaction) of the MLQ and the leader success question from the demographic questionnaire. The three MLQ scales were available from both leaders and observers, but response to the success question was available from only leaders. The analyses were completed for leaders and observers combined (Figure 11), leaders only (Figure 12), and observers only (Figure 13). Fit statistics for all three analyses are given in Table 18.

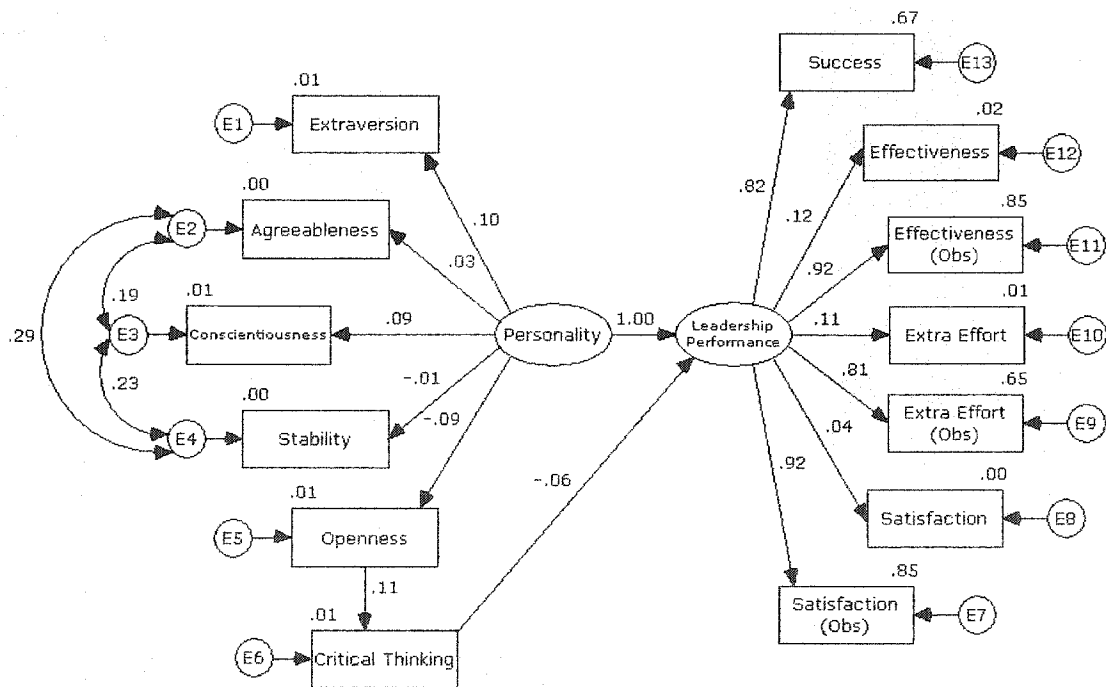


Figure 11. SEM analysis of personality and critical thinking ability as predictors of leader and observer rated outcome scales.

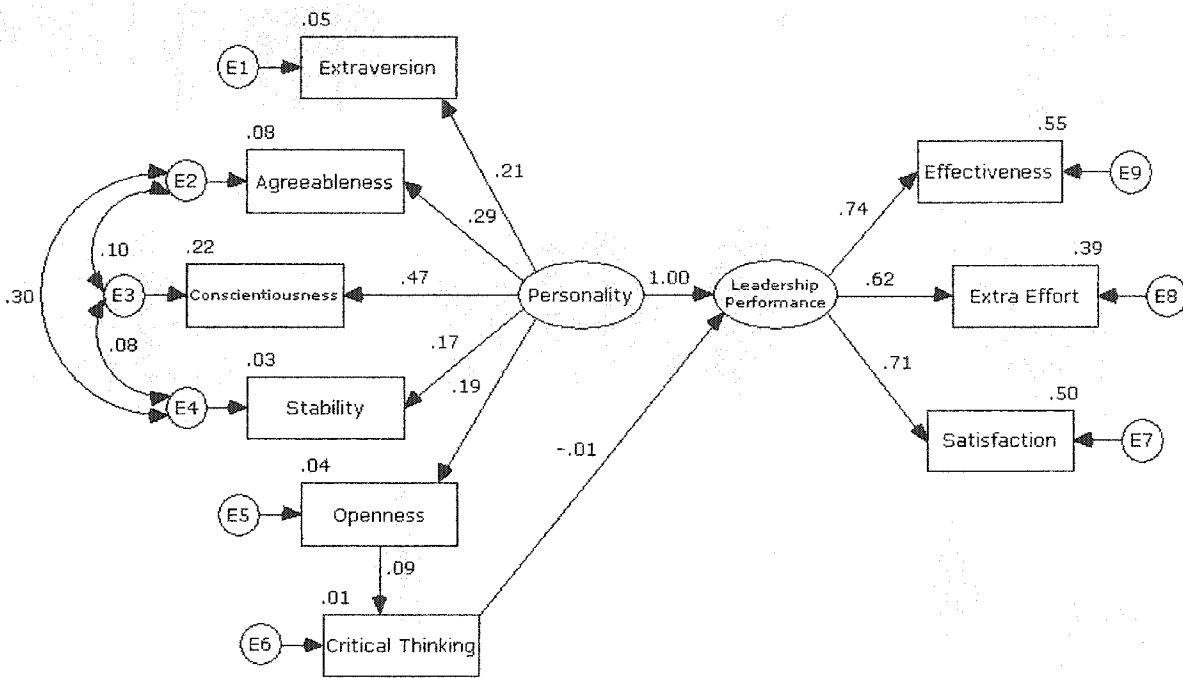


Figure 12. SEM analysis of personality and critical thinking ability as predictors of leader rated outcome scales.

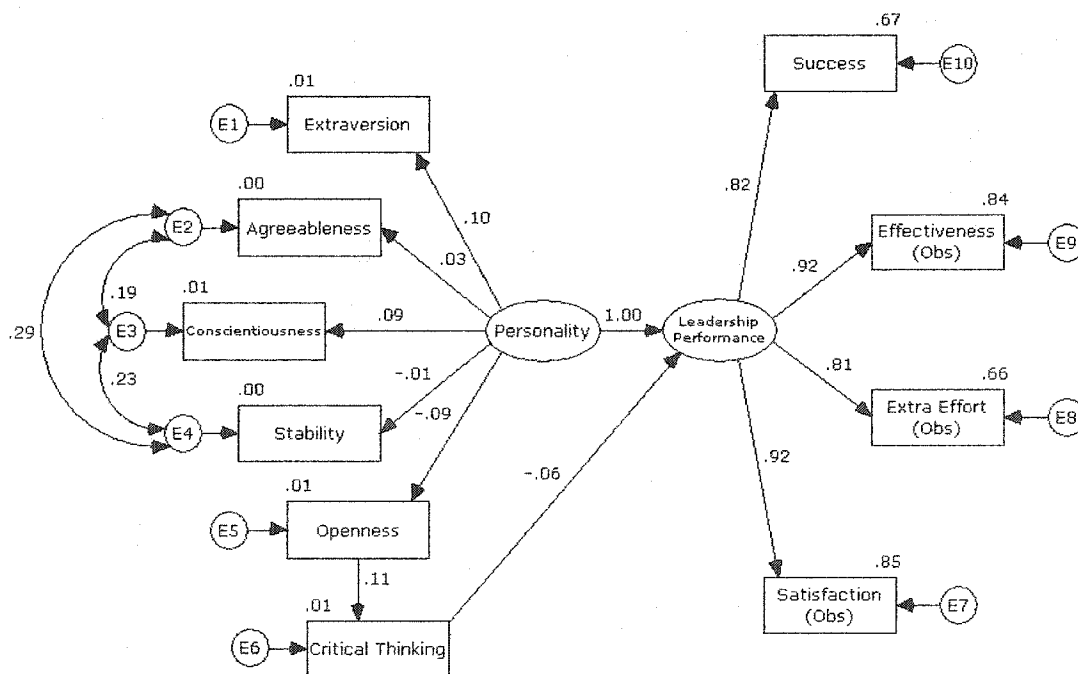


Figure 13. SEM analysis of personality and critical thinking ability as predictors of observer rated outcome scales.

Table 18

Indices of Fit for SEM Analysis of Hypothesis 1 Using Outcome Scores

Model	AGFI	PGFI	CFI	RMSEA	Fit Quality
Combined Outcome Scores	.729	.549	.749	.136	Poor
Leader Outcome Scores	.904	.486	.851	.089	Poor
Observer Outcome Scores	.953	.549	.984	.041	Good

AGFI = Adjusted Goodness of Fit Index; PGFI = Parsimony Goodness of Fit

Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square of Error

Approximation.

An examination of the goodness of fit information in Table 18 reveals that once again, the first hypothesized model is plausible and that leader performance data obtained from observers yield better model fit than data obtained from leaders. The poorest fit was obtained when combined outcome scores were used as the dependent measure. This may be another indication of important differences in the way leader's see themselves as leaders and the way observers perceive their leader's performance. This difference apparently holds true whether the measure of leadership performance is the behaviors and attributes of the leader or the outcomes of the leader's actions.

Also of special note are the very low path coefficients obtained for critical thinking (WGCTA total score) on all of the path and structural equation model analyses conducted for hypothesis 1. All path coefficients were negative and ranged in value from -.01 to -.06 across the 10 models reported. This suggests that critical thinking ability, as measured by the Watson-Glaser Critical Thinking Appraisal, was of virtually no consequence as a predictor of leadership performance.

Hypothesis 2

The second hypothesis (see Figure 3) modifies hypothesis 1 by adding a latent variable to account for leader creativity. Leader creativity was hypothesized to be influenced by both the personality dimension of openness and the leader's critical thinking ability. Also weighing on creativity was the demographic questionnaire item asking leaders and observers to rate the level of the leader's creativity. As for hypothesis 1, hypothesis 2 was first tested using the Transformational–Contingent Reward (TFCR) composite score. Only the model using leader TFCR scores (Figure 14) achieved solution using the AMOS program. Fit indices for this model are presented in Table 19.

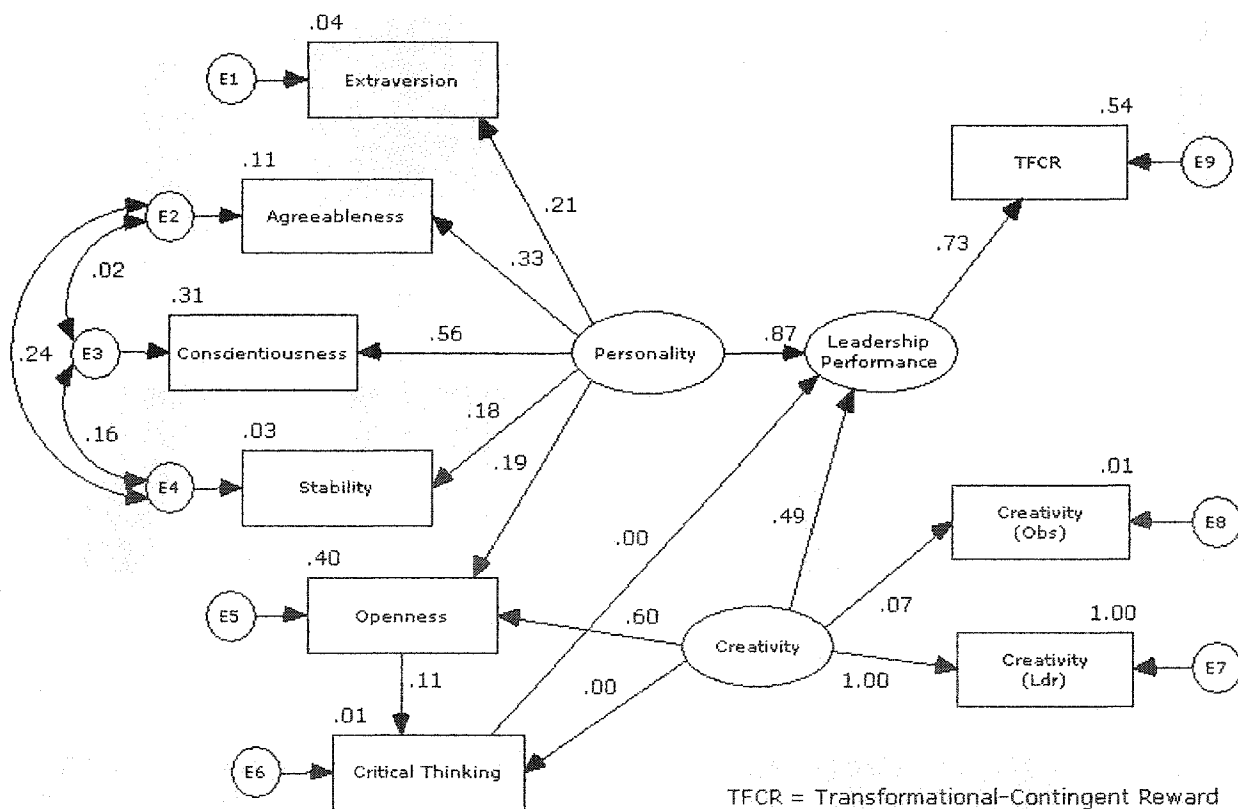


Figure 14. SEM analysis of personality, critical thinking ability, and creativity as predictors of leaders' TFCR MLQ scores.

Table 19

Indices of Fit for SEM Analysis of Hypothesis 2 Using TFCR Leader Scores

Model	AGFI	PGFI	CFI	RMSEA	Fit Quality
Leader TFCR Scores	.965	.438	.988	.024	Very Good

AGFI = Adjusted Goodness of Fit Index; PGFI = Parsimony Goodness of Fit

Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square of Error

Approximation.

Hypothesis 2 was also analyzed using leadership behavior and attribution data from the three-factor, six-factor, and nine-factor structures of the rater form of the *Multifactor Leadership Questionnaire* for both leaders and observers. Only the model using nine-factor observer data (Figure 14) was admissible. Fit indices for this model are presented in Table 19.

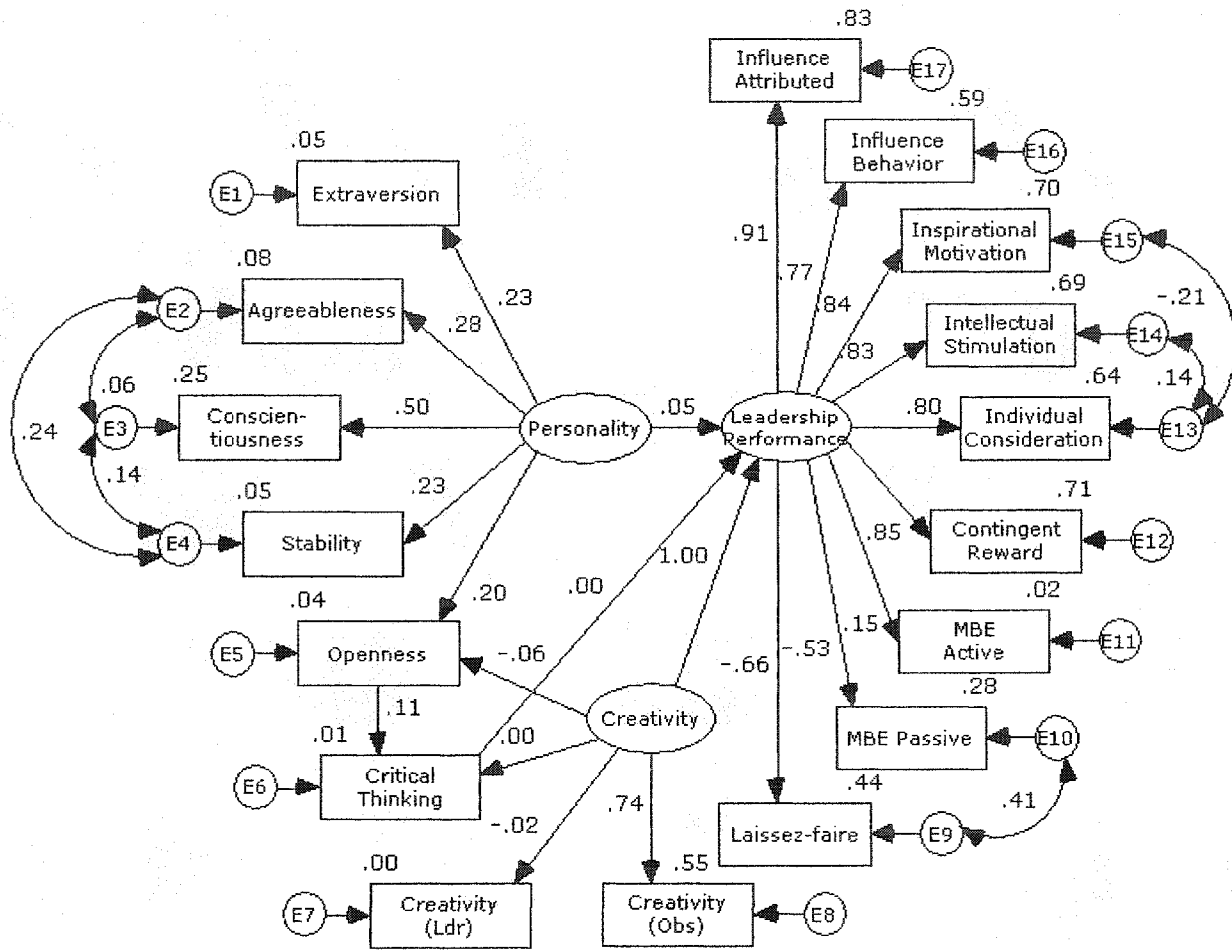


Figure 15. SEM analysis of personality, critical thinking ability, and creativity as predictors of observers' nine-factor MLQ scores.

Table 20

Indices of Fit for SEM Analysis of Hypothesis 2 Using Nine-Factor MLQ Observer Scores

Model	AGFI	PGFI	CFI	RMSEA	Fit Quality
Observer 9-Factor Scores	.859	.641	.900	.082	Poor

AGFI = Adjusted Goodness of Fit Index; PGFI = Parsimony Goodness of Fit

Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square of Error

Approximation.

Fit indices for the structural equation analysis of hypothesis 2 using nine-factor leadership behavior and attribute measures from the MLQ indicate that hypothesis 2 is not a well supported model of the relationships between personality, critical thinking, and creativity as independent variables and leadership performance as the dependent variable.

As a final examination of hypothesis 2, analyses were completed using the three leadership outcome scales of the MLQ (Effectiveness, Extra Effort, and Satisfaction), and the leadership success question from the observer demographic questionnaire. The results for combined leader and observer data are shown in Figure 15. Results for leader data alone are shown in Figure 16, and results for observer data alone are shown in Figure 17. Table 20 provides fit indices for all three models.

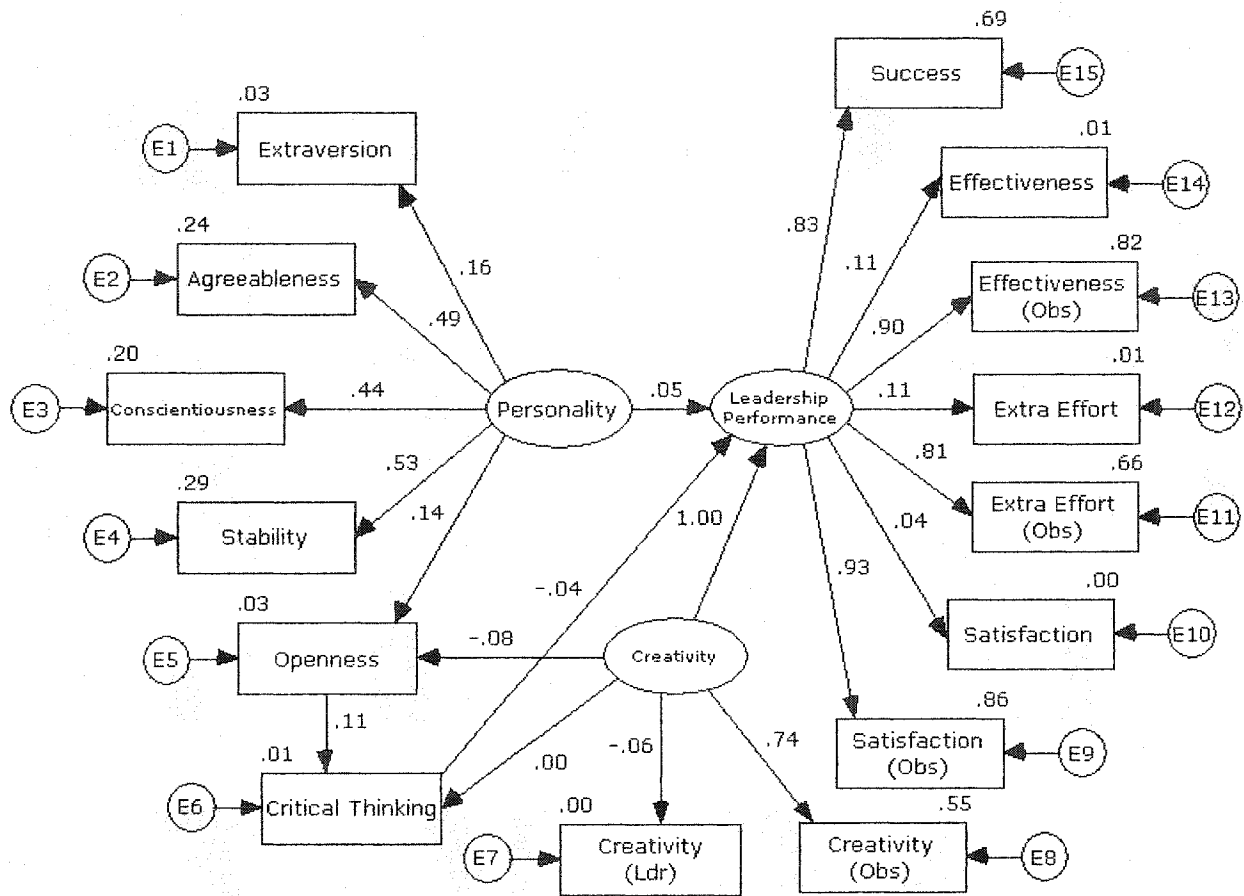


Figure 16. SEM analysis of personality, critical thinking ability, and creativity as predictors of leader and observer rated outcome scales.

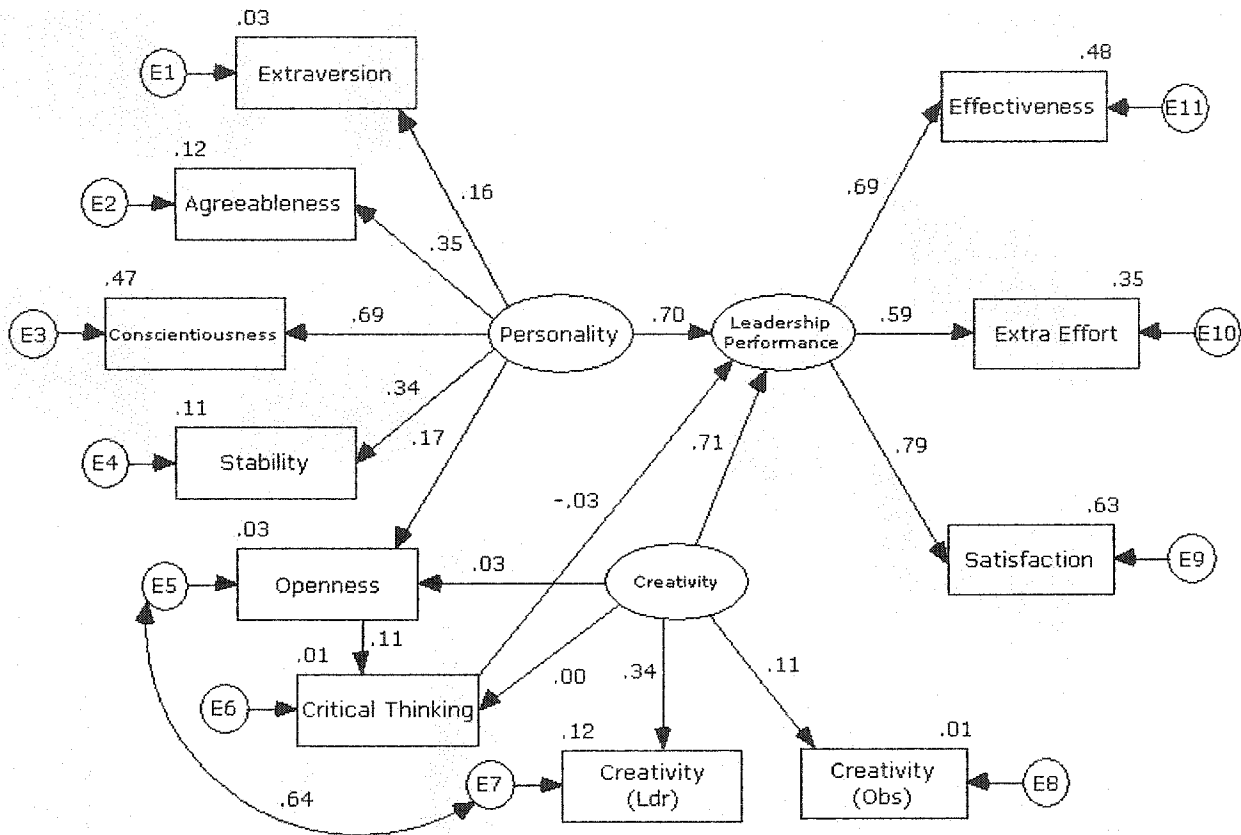


Figure 17. SEM analysis of personality, critical thinking ability, and creativity as predictors of leader rated outcome scales.

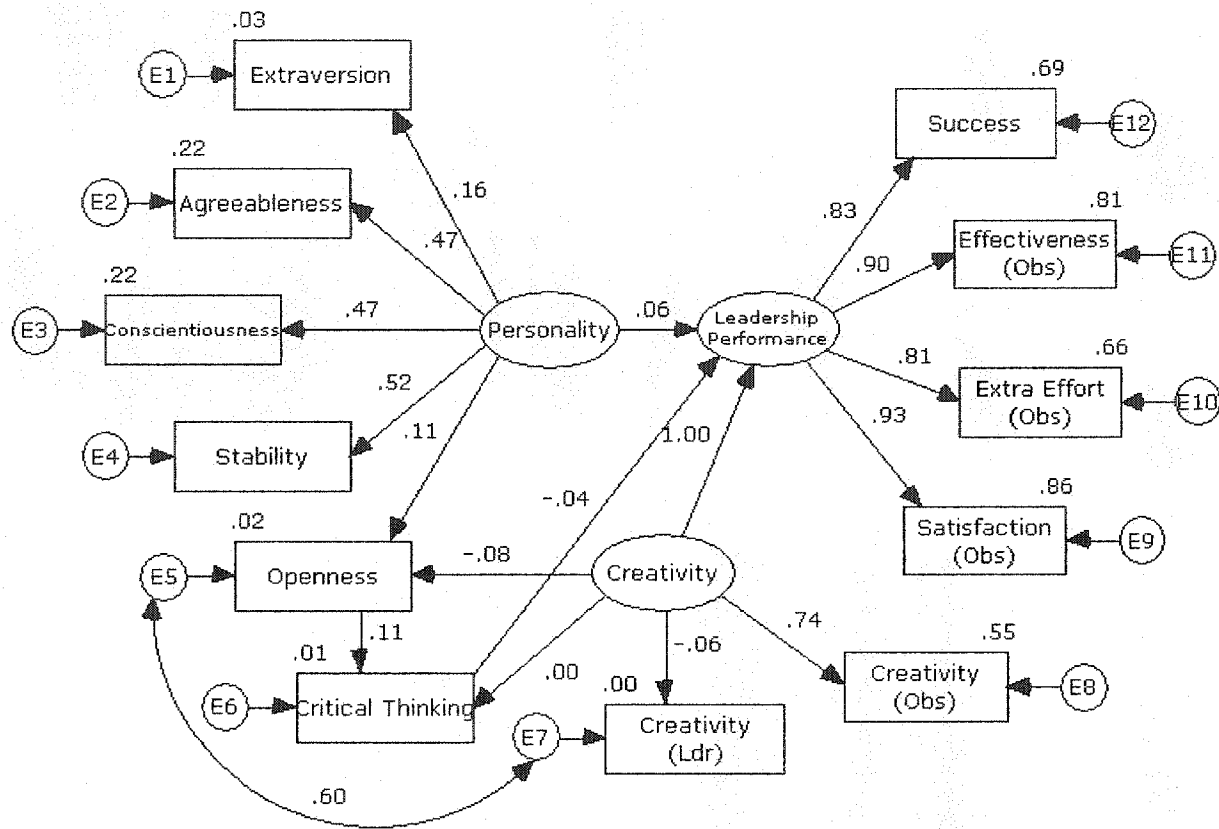


Figure 18. SEM analysis of personality, critical thinking ability, and creativity as predictors of observer rated outcome scales.

Table 21

Indices of Fit for SEM Analysis of Hypothesis 2 Using Outcome Scores

Model	AGFI	PGFI	CFI	RMSEA	Fit Quality
Combined Outcome Scores	.697	.561	.696	.143	Poor
Leader Outcome Scores	.901	.556	.865	.078	Poor
Observer Outcome Scores	.913	.594	.953	.067	Good

AGFI = Adjusted Goodness of Fit Index; PGFI = Parsimony Goodness of Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square of Error Approximation.

As the results presented in Table 20 indicate, the plausibility of hypothesis 2 is supported when leadership performance is defined in terms of the outcomes of the leader's actions.

Summary

Electronic mail was used to solicit 2,630 student leaders and 1,317 student observers from 13 North Carolina and Virginia colleges and universities for participation in this study. Data were gathered from 616 leaders and 509 observers to yield 413 complete sets of leader data (all study instruments completed). When leader data were matched to observer data, 349 leader-observer data pairs were produced.

The rate of missing data varied by instrument and ranged from 0.32% to 1.37%. Missing data for the *Mini-Markers* personality inventory and the *Multifactor Leadership Questionnaire* were replaced using a multiple imputation method.

Factor analysis of the study instruments replicated the published five-factor structure of the *Mini-Markers* personality inventory and confirmed that the *Watson-Glaser Critical Thinking Appraisal* was properly reported as a single measure of critical thinking, as the test manual recommends. Factor analysis of the *Multifactor Leadership Questionnaire* produced a three-factor solution rather than the six- or nine-factor solutions respectively recommended by the instrument manual and the more recent factor structure review of Antonakis et al. (2003).

Path analysis and structural equation modeling were used to examine two hypothesized models of leadership performance. Eleven models, each employing different measures of the leadership performance dependent variable, were analyzed for each hypothesized model. Both models produced good fit for one or more measures of the dependent variable. Of the 22 models, 7 failed to achieve a solution.

CHAPTER V

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

This chapter summarizes the research findings of this study, relates these findings to the larger body of research on the cognitive and personality correlates of leadership performance, examines the implications of the results for current theory, and offers recommendations for future related research.

Summary of Findings

Effective leadership is widely seen as critical to the success of organizations of all types and to societies around the world. Leaders and the qualities that makes one an effective leader have been topics of discussion and debate for centuries. We are fascinated with the apparent ability of individual leaders to turn failing organizations into successes and we often decry the shortage of "good" leaders. Many colleges and universities in the United States have established leadership development programs for their students and formally adopted educational goals related to the preparation of their students for positions of leadership in society. Although leadership research clearly indicates that personality and cognitive attributes are strongly related to leadership effectiveness, the combined effects of personality and cognitive attributes have not been well studied.

This study sought to fill some of this gap in understanding by testing two hypothesized models of leadership that relate the personality attributes and critical thinking abilities of leaders to their perceived leadership effectiveness.

The goals of the study were confirmatory. It employed path analysis and structural equation modeling to confirm previously identified relationships between personality factors, critical thinking ability, and leadership performance.

Participants

The participants, on whom this study was focused, were undergraduate college students, age 18–26, who were the formally designated or elected leaders of institutionally recognized student organizations at one of 13 colleges and universities in North Carolina and Virginia. These student leaders came from a wide variety of organizational types including academic, arts, athletic, Greek societies, honor societies, media, religious, service, special interest, and student government. Several research instruments designed to assess personality, critical thinking ability, and leadership performance were administered to these student leaders. In addition to data gathered from the student leaders, members of the organizations that the student leaders led provided observer ratings of the leadership performance of the student leaders.

The entire study was conducted via the Internet. Email messages soliciting participation in the study were sent to 2,630 leaders. Of these leaders, 95 could not be contacted because of unrecognized email addresses, and 757 agreed to participate in the study. The resultant rate of participation, based on successfully sent emails, was 30%. The rate of participation for those leaders who received and read the solicitation email could not be determined.

Solicitation emails were also sent to 1,317 observers. Of these observers, 47 could not be contacted because of email problems, and 531 agreed to participate in the study. The resultant rate of participation, based on successfully sent emails, was 42%.

Research Instruments

Student leaders were asked to complete a demographic questionnaire, the *Mini-Markers* personality inventory, *Watson-Glaser Critical Thinking Appraisal* (WGCTA), and *Multifactor Leadership Questionnaire* (MLQ). Of the 757 leaders who had volunteered to participate in the study, 616 completed the demographic questionnaire, 614 completed the *Mini-Markers* inventory, 435 completed the WGCTA, and 466 completed the MLQ.

Observers were asked to complete a demographic questionnaire and the rater form of the MLQ. Of the 531 observers who had volunteered to participate in the study, 509 completed the demographic questionnaire and 468 completed the MLQ.

Results of Statistical Analyses

The statistical analyses of the data obtained from these instruments were conducted using the SPSS (version 13) and AMOS (version 5) computer programs.

Comparison of MLQ Self and Rater Results

Paired-sample *t* tests were conducted to determine whether leaders and observers rated leadership performance on 12 individual and two combined scales of the *Multifactor Leadership Questionnaire* the same. The results,

shown in Table 13, indicate that there were significant differences in leadership ratings on 9 of the 14 MLQ scales.

Factor Analyses

The results of the personality, critical thinking, and leadership instruments were factor analyzed to determine if their reported subscales could be replicated as factors. The five personality dimensions reported by the *Mini-Markers* personality inventory were completely replicated in this factor analysis. On the other hand, none of the five subtests of critical thinking reported by the WGCTA emerged as factors in this analysis. This result supports the test manual's recommendation that users of the WGCTA should consider the combined results of the five subtests as measuring a single critical thinking ability (Watson & Glaser, 1980). Finally, factor analysis of the MLQ revealed that the MLQ data obtained in this study were best represented by three leadership factors rather than the nine scales recommended by Antonakis et al. (2003) and reported by the instrument, or the six factor grouping of instrument scales recommended in the instrument manual (Bass & Avolio, 2000).

Path and Structural Equation Model Analyses

Path and structural equation analyses were completed for two hypothesized models (see Figures 2 and 3) that relate personality and cognitive attributes of the student leader to his or her leadership performance. The models differed in that one used critical thinking as the cognitive measure and the second model used both critical thinking and a latent creativity variable as

the measures of cognitive ability. Several versions of these basic models were analyzed. Each version used a different set of leadership performance measures derived from *Multifactor Leadership Questionnaire* and the demographic questionnaire.

Hypothesis 1 was supported. Overall, the five-factor model dimensions of personality, as measured by the *Mini-Markers* personality inventory, and critical thinking ability, as measured by the *Watson-Glaser Critical Thinking Appraisal*, effectively predicted leadership performance. However, the quality of the model fit varied depending on the measures of leadership performance used and the perspective from which the leadership performance data were reported.

The simplest version of the hypothesis 1 model used only the Transformational-Contingent Reward (TFCR) score as the dependent variable measure of leadership performance. Good fit was obtained for this model regardless of whether TFCR scores came from leader self-reports or from observer reports. When the multiple measures of leadership performance were used as dependent variables, MLQ scales obtained from leader reports no longer produced good model fit, whereas good fit was obtained from observer reported data for this model using both six-factor and nine-factor MLQ scores as the dependent variables. Good fit was also found for the hypothesis 1 model when observer reported measures of the outcomes of leader actions (i.e. success, effectiveness, extra effort, and satisfaction) were used as the dependent variables. Analysis of the hypothesis 1 model, employing three-

factor MLQ scores obtained from observers as the dependent variables resulted in an inadmissible solution.

Support for hypothesis 2 was also found when the model employed leader reported TFCR scores and observer reported measures of the outcomes of leader actions as the dependent variables. However, these were the only versions of the hypothesis 2 models that achieved good model fit.

Hypothesis 2 was analyzed using 11 variations of MLQ and demographic questionnaire dependent variable data. These data included TFCR scores; three-factor, six-factor, and nine-factor MLQ scores; and leadership outcome scores, each from both leader self-reported data and observer reported data. The eleventh scale consisted of combined leader and observer reported leadership outcome scores. Of the 11 analyses, 6 were inadmissible. The five successful analyses used leader TFCR scores, observer nine-factor scores, leader outcome scores, observer outcome scores, and combined leader and observer outcome scores. Only the analyses using leader TFCR scores and observer outcome scores achieved good fit, the remaining three analyses achieved poor quality fit.

Examination of the successful path and structural equation analyses for hypotheses 1 and 2 yields two sets of conclusions concerning the effects of critical thinking and personality dependent variables on leadership performance.

First, it appears that critical thinking ability played a very small part in the determination of leadership success. The magnitude of the effect of critical

thinking on leadership performance in the 15 successfully analyzed models was small and negative, ranging from .00 to -.06. Critical thinking also had no discernable effect on the latent creativity variable in the five successful hypothesis 2 analyses.

Second, an examination of hypothesis 1 models reveals that when leadership performance was measured by leader reported MLQ scales focusing on leader *behaviors and attributes*, the personality factor of Openness consistently had the largest effect on leadership performance and Stability had the smallest. On the other hand, when leadership performance was measured by observer reported MLQ scales that focused on leader *behaviors and attributes*, the personality factor of Extraversion had the largest effect and Agreeableness had the smallest. When leadership performance in hypothesis 1 models was measured by *leadership outcome* scales obtained from both leader self-reports and observer reports, the influence of personality factors shifted, and the influence of Conscientiousness increased greatly, although from the observer viewpoint, Extraversion was still slightly more influential.

When the influence of creativity was separately accounted for in hypothesis 2 models by the inclusion of the creativity latent variable and the observed variables of leader- and observer-estimated leader creativity, Conscientiousness emerged as strongly influential on leader *behavior and attribution* measures from both the leader and observer viewpoints. The influence of Conscientiousness remained strong in the hypothesis 2 model that used *leadership outcome* scales assessed from the leader's perspective as the

dependent variable, but Stability emerged as the most influential personality factor when *leadership outcome* scales were assessed from the observer's perspective.

Discussion

Outcome Measures

It is apparent from the comparison of leader and observer responses to the *Multifactor Leadership Questionnaire* (see Table 13) that leaders and observers perceived the performance of the leader differently. One likely explanation for these differences in perceived leadership performance is the influence of an actor-observer discrepancy, in which leaders' ratings of their own behavior were affected by their beliefs about the influence of situational factors on their leadership performance, whereas observers' ratings of the leaders' behaviors were affected by the observers' tendency to assume that the leaders' behaviors were the result of the leaders' dispositions (Nisbett et al., 1973). Subjective measures of performance, such as the MLQ, are often susceptible to the influence of the actor-observer discrepancy.

Cognitive Factors

A very large body of leadership research conducted over nearly a full century supports the conclusion that cognitive abilities are important for leadership success. In a 30-year longitudinal study of Bell System managers, Howard and Bray (1990) concluded that cognitive ability was the most important predictor of managerial success at year 20. Different facets of cognitive ability have been recognized as important to leadership success.

Intelligence (Lord et al., 1986), cognitive complexity (Jaques & Clement, 1994), creative problem solving (Mumford & Connelly, 1991), and reflective judgment (P. M. King & Kitchener, 1994) have all been positively associated with leadership success. This study used critical thinking as its measure of cognitive ability because of the strong connection that critical thinking has with these key cognitive abilities.

Despite prior evidence for the importance of critical thinking ability, this study found that critical thinking ability had virtually no influence on leadership performance. The explanation for the trivial role of critical thinking ability as a determinant of the leadership performance of college student leaders may lie in the situational characteristics and demands of college student leadership. Most of the studies that found cognitive abilities to be important for leadership performance focused on adult leaders of complex organizations that faced challenging demands and difficult problems, often in environments of ambiguity and uncertainty. The success of leaders in these organizations depended to a significant extent on the leaders' ability to analyze situations, solve problems, formulate plans, establish direction, and evaluate progress. It seems unlikely that many college student organizations face difficult demands such as these, that would put a premium on the problem solving and critical thinking abilities of their leaders. Thus, the failure of critical thinking ability to emerge as an important determinant of college student leader performance is not surprising.

In a similar vein, the demand for creativity in college student leaders is probably nearly as small. Although there may be some student organizations whose situations require a high level of leader creative ability, the majority of college organizations do not. The research evidence for the importance of creativity in leadership success comes again from studies of organizations that must frequently resolve ill-defined problems (Mumford & Connelly, 1991). Such an environment is not typical of college student organizations, and so the influence of leader creativity on leadership performance is likely to be small in student organizations.

Personality Factors

Only a few studies have directly examined the relationship between the dimensions of the five-factor model of personality and leadership performance. In one such study by McDaniel (1992), leaders scoring high on Openness and Conscientiousness were rated as being more effective leaders of change. Judge and Bono (2000) found that the five-factor model traits of Agreeableness, Extraversion, and Openness were positively correlated to transformational leadership, although the effect of Openness became non-significant when the effects of other factors were controlled. The results of this dissertation were similar. When MLQ behavior and attribution scales reported by leaders were used as the dependent variables in hypothesis 1 analyses, the personality factor of Openness emerged as having the largest effect on leadership performance, and when observer reported scales were used, the personality factor of Extraversion emerged as having the largest effect on leadership

performance. However, in hypothesis 2 analyses the introduction of the latent creativity variable mediated the effects of Openness, and Openness became the least influential personality factor on leadership performance in all but one model.

An examination of the patterns of relationships between the five personality independent variables and the leadership performance dependent variable in hypothesis 1 models is informative. When leadership performance was assessed from the leader's point of view, using the behavior and attribution scales of self-reported MLQ data, Openness and Conscientiousness emerged, in that order, as the two personality factors that most influenced leadership performance. On the other hand, when leadership performance was assessed as perceived by members of the leader's organization, Extraversion emerged as the most influential dimension of personality and Openness as the second most influential dimension. However, the direction of influence for Openness switched from positive when leadership performance was gauged from the leader's own perspective to negative when leadership performance was gauged from the observer's perspective.

Considering these results, it seems reasonable that the leader who was open to new experiences and who was stimulated by new ideas would also have embraced the behaviors characteristic of transformational leadership, which emphasize interpersonal influence, vision, motivation, and intellectual stimulation. On the other hand, the social nature of most college organizations might have lead observers to be most influenced by the leader's Extraversion,

with more extraverted leaders being favored by organization members. Such a preference for extraverted leader behavior could, in turn, have created a halo effect on observer ratings of leadership performance.

This interpretation was further indicated when the influence of personality on leadership outcome measures, as opposed to behavioral measures, was assessed. When outcome measures were assessed from the leader's perspective, the pattern of influence of personality shifted, and the traits of Conscientiousness and Agreeableness emerged as the most influential dimensions of personality. However, when outcome measures were assessed by observers, Extraversion remained the most influential personality factor, although Conscientiousness and Openness (in the negative direction) were tied in a close second position. It seems reasonable that Conscientiousness and Agreeableness would be related to the leadership outcome measures (Success, Effectiveness, Extra Effort, and Satisfaction) used in this study. In fact, Hogan (1994), found that many of the traits identified by Stogdill's (1948) review of effective leaders could be mapped to the big-five factors of Conscientiousness and Agreeableness. However, the persistence of Extraversion as the most influential personality trait from the observer's perspective, despite the focus (leadership behavior or leadership outcomes) of the leadership performance measure, may indicate the presence of a halo effect as noted above.

On the other hand, instead of the influence of a halo effect, it may well be that the preference for extraverted leader behavior by observers is explained by the social exchange that takes place within college student organizations.

From a social exchange perspective, the leader is engaged in an exchange of "goods" with the follower. This exchange imposes costs on both leader and follower and also provides rewards to both. Costs for the leader may be in the form of time and attention given to the follower, whereas costs for the follower may consist of performing tasks that the leader requests. Rewards for the leader include the acquisition of status, esteem, and increased influence and power. For the follower, rewards come in the form of the fulfillment of needs such as the needs for affiliation, belonging, acceptance, recognition, status, personal validation, etc. When both leader and follower believe that the value of rewards outweighs the magnitude of the costs, the exchange relationship and the attraction between leader and follower tend to persist and grow stronger.

This exchange concept can be extended to the relationship between individual organizational members and the organization to which they belong. Individual needs can be fulfilled by membership in the organization, and the organization itself can benefit from the presence and contributions of the member. The value of the reward that the member receives is largely determined by the size, activity, and prestige of the organization. For example, a large, active organization may make a significant contribution to the member's needs for affiliation, belonging, acceptance, and personal validation. If the organization is selective and exclusive, the member will also gain rewards of prestige and recognition. The leader enjoys power, influence, prestige, and the fulfillment of other needs similar to those of the members.

Although college organizations may exist for a wide variety of purposes, most college organizations share several characteristics: membership is voluntary, the social interaction of members is a major purpose, and the promotion and growth of the organization is a primary goal. Given these characteristics, it is easy to understand why leader Extraversion might be critical to the success of the organization. A leader who is extraverted and consequentially socially attractive or even charismatic, benefits the organization by attracting and retaining members for the organization. The extraverted leader's contribution in the collective leader-member exchange is the survival, growth, and maintenance of the group itself. Thus, Extraversion becomes not a personality trait that biases members' perspectives through the creation of a halo effect, but rather an essential and unique contribution of the leader to the group's success and prosperity, and therefore to the rewards of group membership.

Limitations of the Study

Of the 22 path and structural equation model analyses conducted in this study, 7 failed to achieve a solution (failed to converge or minimize) or produced inadmissible solutions. All three of these problems may be caused by an incorrect model, a sample size that is too small, or data that violate SEM assumptions. It is difficult to determine which of these factors may have been at fault.

To examine whether violation of SEM assumptions produced the failed solutions, the full dataset was examined to detect non-normal distribution of

data, the presence of outliers, and the existence of multicollinearity. Square root data transformations were applied to correct variables for moderate skewness. Transformed data were then examined for the presence of multivariate outliers using the Mahalanobis distance statistic at $p < .001$. This examination resulted in the identification of 16 outliers in the 349 participant dataset and 17 outliers in the 413 participant dataset. Elimination of these outliers reduced the size of these datasets to 333 and 396 cases respectively, with a parallel reduction in statistical power. Multicollinearity diagnostics were then calculated for the several combinations of variables found in the models analyzed in this study. No cases of multicollinearity were found. Each of the 22 path and structural equation models was then re-analyzed using these transformed and purged datasets. Comparison of the path and SEM solutions produced from the original datasets and the transformed and purged datasets revealed the same patterns of path coefficients, indicating that the moderate violations of normality found in the original datasets were probably not large enough to result in the seven failed model solutions. In fact, the transformed and purged datasets produced two fewer hypothesis 2 solutions than did the original datasets. It appears likely that these additional failed solutions were the result of the loss of power due to the reduced sample sizes of the transformed and purged datasets.

In the case of inadmissible solutions, both correct and incorrect models with low inter-variable correlations can produce good fit. When correlations are low, fit is more easily achieved, yet SEM may lack the power to reject an

incorrect model. Increasing the sample size may result in sufficient power to permit SEM to differentiate correct and incorrect models. Experimentation with one model suggests that sample size was an important factor in the production of inadmissible solutions. In this case an hypothesis 2 model, using leader reported data as the measure of leadership performance, was inadmissible when the 349 participant dataset was used, but became admissible when the number of participants in the dataset was increased to 413. It should be noted that in order to be able to use the larger leader sample, it was necessary to modify the model slightly by removing the variable for the observer assessment of leader creativity. This simplified the model and thereby reduced the power needed to reject a poor model. At the same time, the increased N served to increase power. The combined effect of reduction in required power and increase in available power enabled the achievement of an admissible solution. With the removal of the observer reported leader creativity variable, the model was changed, but the same model with the observer reported leader creativity variable in place produced an admissible solution when observer data were used as the measure of leadership performance.

In light of the results of the examination of normality assumptions and the experimentation with sample size, it seems most likely that sample size, and not the model itself or violations of SEM assumptions, was the cause of the failed and inadmissible solutions.

Other limitations of this study include the population to which the results may be confidently extended. This study focused on student leaders from 13

colleges and universities in North Carolina and Virginia. The results may be extended to student leaders in other colleges and universities to the extent that student leaders in other institutions are like those who participated in this study. Although the results of this study may offer suggestions for leadership research in other types of organizations, the differences in environment and the demands placed on leaders in non-college organizations, especially organizations that must often resolve difficult problems, make it inappropriate to attempt to extend the results of this study to non-college organizations and leaders.

A final limitation of this study is the single measure of cognitive ability employed. Critical thinking was the only measure of cognitive ability used. Although critical thinking skills are required elements of a wide range of cognitive abilities, there are other aspects of cognitive ability, such as problem solving, reflective judgment, and intelligence, that might have been addressed.

Recommendations

Recommendations for Practice

One of the primary goals of this study was to learn about the influence of personality and cognitive variables on leadership performance so that college leadership development programs could be better designed to prepare their students for positions of leadership after graduation.

When the results of this study were compared to previous leadership research, which drew subjects from formal extra-collegiate organizations, one of the important implications that emerged was that leadership demands in

college student organizations appear to be significantly different than leadership demands found in most extra-collegiate organizations. Whereas the most important outcome of leadership efforts in college organizations may be the attraction of new members and enhancement of the viability and attractiveness of the student organization, extra-collegiate organizations are more likely to measure leadership success in terms of the solution of problems, business productivity, and other bottom-line measures. Related to this is this study's finding that critical thinking ability played a very small role in determining leadership performance. Yet, considerable previous research has consistently supported the importance of cognitive ability as a determinant of leadership success in complex adult organizations that routinely face difficult problems, often in environments of ambiguity and uncertainty.

If the leadership demands and environment found in college student organizations do not parallel those of post-college organizations, how then are college leadership development programs to prepare students for future leadership challenges? Perhaps the best approach that leadership development programs can take is to directly address the differences in the leadership environments and demands between college student organizations and extra-collegiate organizations. The initial goal of this approach would be to make student leaders aware of the social exchange nature of organizations and of the fact that differences in organizational goals and environments require different leader behaviors and competencies, if the leader's contribution to the organization is to be valuable. A subsequent goal would then be to facilitate

the development of leadership behaviors and competencies requisite for success in extra-collegiate organizations.

Key to the development of leaders is their exposure to environments and repeated engagement with leadership problems similar to those found in post-college organizations. To accelerate the development of student leaders and maximize the benefits of this exposure, student leaders should be provided feedback from experienced leaders. One approach might be to establish a mentorship or internship program that pairs students enrolled in the college's leadership development program with experienced leaders from both the college and surrounding communities. The leadership mentor could expose the student leader to the leadership challenges that exist within the mentor's organization and help the student leader contrast the leadership environment and demands of the student leader's own organization to those of the mentor's organization. The student leader could also use a current leadership challenge in the mentor's organization as a practical exercise, by formulating possible solutions to the challenge and discussing these solutions with the mentor.

Leadership mentors may also help student leaders learn how to assess the effectiveness of their leadership behaviors. Student leaders need to understand that their own perceptions of the effectiveness of their leadership performance and the perceptions that members of their organization have are likely to differ significantly. As a consequence, student leaders should be taught to value the candid leadership performance feedback of members of their organization and effective methods for obtaining such feedback.

Recommendations for Research

Based on the findings and limitations of this study, the following recommendations are offered for future research.

It is important that researchers use a multivariate approach to the examination of the determinants of leadership performance and success. Structural equation modeling is one effective multivariate approach that should be considered. Multivariate approaches have the advantage of identifying the component contributions of factors that affect leadership performance and success. Knowledge of the degree of contribution of these factors and the nature of their interplay may allow the development of superior methods of leader development and selection.

Although the basic form of the path and structural equation models examined in this study were supported, future research is required to more precisely identify the factors of personality and cognitive ability that are most relevant to leadership. To this end, personality instruments that measure more narrowly defined traits, such as the NEO PI-R (Costa & McCrae, 1992) might be used. The NEO PI-R provides measures of not only the big-five personality factors, but also measures of 30 "facet" subscales of the big-five. Also, different aspects of cognitive ability, such as reflective judgment, problem solving, intelligence, etc. should be examined. In addition to more varied and precise measures of the personality and cognitive ability independent variables, different dependent variable measures of leadership performance and success

should be employed. Especially important are quantifiable measures of leadership success.

This study employed the scales of the *Multifactor Leadership Questionnaire* and a single item observer rating of the leader's success as measures of the leadership performance dependent variable. These measures of leadership performance are but two of many possible measures that might have been used. Selection of leadership performance outcome measures is driven by several considerations, including the population of interest, research objectives, theory, analysis methods, and practicality. The population of interest limits the set of relevant research questions and types of outcome measures that may be available or obtained. For example, it may be more difficult to obtain quantifiable measures of leadership success for student leaders than for leaders of business organizations. Research objectives affect the relevance of potential dependent variable measures. For example, research seeking to inform the design of student leadership development programs may have different foci than research aimed at the enhancement of leadership effectiveness in small military units. Theory drives the definition of leadership, the identification of leaders, and the choice of outcome measures. For example, one theory might emphasize formal as opposed to emergent leadership, or one theory might emphasize charismatic leadership while another focuses on exchange relationships. Analysis methods are selected to best answer the research questions, but the selection of methods is tempered by the nature and quantity of available data. Finally, issues of practicality,

such as the ability to identify and contact participants, the willingness of participants to devote the time required for participation, the availability of suitable existing outcome data, and the practicality of administering instruments or gathering observations limit the dependent variable data that may be used.

When designing leadership research pertaining to college students, the considerations of population of interest, research objectives, theory, analysis methods, and practicality will have a significant influence. This influence may be limiting and may greatly increase the difficulty and expense of conducting the research. For example, although it may be desirable to study student leaders who face difficult organizational problems, similar to those faced in extra-collegiate organizations, the difficulty of identifying such student leaders and their relatively small numbers may make such research impractical. In a similar vein, the study of emergent leaders (those not formally designated as leaders) in college student populations may be made more demanding by the students' limited perceptions of themselves as leaders and by the difficulty of obtaining observer ratings of the emergent leaders' performance.

Finally, future research should employ the techniques of this study to examine other types of organizations and organizational environments. It should also examine leaders facing different leadership demands, especially demands expected to place a significant emphasis on cognitive abilities, and working at different levels of the organizational hierarchy.

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Appendix A

Participant Solicitation Email for Leaders



The College of

WILLIAM & MARY

School of Education
P.O. Box 8795
Williamsburg, VA 23187-8795

January 26, 2005

Jane Doe
Students for Learning
College of William and Mary

Dear Jane,

I am a doctoral candidate in the closing months of my program of study here at The College of William & Mary. I am currently working on my dissertation which examines the relationship of personality traits and critical thinking ability to the leadership performance of undergraduate college student leaders. College of William and Mary records indicate that you are the primary leader of the student organization shown above. As a college student leader, your participation in this study would be extremely helpful.

Many colleges place a high value on the development of students to assume roles of leadership in society. A large number of colleges have implemented formal leadership development programs for students, and virtually all colleges offer opportunities for interested students to pursue positions of leadership on campus. Yet, despite this widespread emphasis on leadership development, little is known about the personality and cognitive attributes that underlie college student leadership performance. This dissertation study is designed to examine these attributes so that more effective college student leadership development programs may be designed.

I know that this is a busy time for you, but I really need your help. That is why I have selected questionnaires that should take a total of less than an hour of your time. In addition, to make participation as easy as possible for you, I have set-up a secure website through which you can complete the questionnaires used in the study. At this website you will find a full description of the participation that I am asking of you and your rights as a research participant. After reading this information you will have the opportunity to indicate your choice to participate in the study or not.

The website address and your personal login information is as follows:

Website address: ... <https://alleon.people.wm.edu/>
User ID:.....doexxja
Password:.....GreenApple
Select“Leader” button

Please be assured that as allowed by the law I will protect the confidentiality of the information you provide to me. I will not reveal the fact that you participated in the study or link your identity to the information or answers you give to any of the study questionnaires without first asking for your permission to do so.

As a token of my appreciation, I will enter you into a drawing for one of three cash prizes of \$50.00 each, to be awarded to study participants who complete all requested questionnaires. In addition, I would be happy to send you the results of the personality, critical thinking, and leadership questionnaires that you complete for the study. You may find the feedback from these instruments to offer useful personal insights. Finally, I will also send you a summary of the results of the study upon its completion. Please indicate your desire to be entered into the cash prize drawing, receive your personal questionnaire results, and/or receive the study summary by checking the appropriate blocks on the personal information questionnaire on the study website.

This study has been approved by both my dissertation committee and The College of William and Mary Protection of Human Subjects Committee.

If you have any questions regarding this study, please feel free to contact me at (757) 999-1111 or alleon@wm.edu.

Sincerely,

Arnold L. Leonard

Arnold L. Leonard
Doctoral Candidate

This project was found to comply with appropriate ethical standards and was exempted from the need for formal review by the college of William and Mary protection of human subjects committee (phone: 757-221-3901) on November 17, 2004 and expires on November 16, 2005.

Appendix B

Informed Consent Disclosure and Decision Form

Informed Consent

Student Leader Informed Consent

Before you participate in the *Foundations of Leadership Study*, it is important that you understand the nature of the study, the participation being requested of you, and your rights as a study participant. Please read the information below and indicate whether or not you are willing to participate in the study by selecting the appropriate choice at the bottom of the screen and clicking on the "Submit Choice " button.

Introduction and Purpose

You are being asked to participate in a research study being conducted by Arnold L. Leonard, a doctoral candidate in the School of Education at the College of William and Mary, in support of his Ph.D. dissertation. This study is designed to investigate the relationship of personality traits and critical thinking ability to the leadership performance of college student leaders. I hope that by gaining a better understanding of how personality and critical thinking ability relate to each other and to the leadership performance of college student leaders, college educators may be able to develop more effective programs to promote the development of students as leaders.

Procedures and Questionnaires

As a participant in this study, you will be asked to respond to the four questionnaires described below:

The *Basic Information Questionnaire* is a short questionnaire that asks for some basic background information about you and the student organization that you lead. It also asks you to nominate three members of the organization that you lead who you believe have observed your leadership of the organization to be able to accurately describe your leadership style. I will ask these members to describe your leadership style by completing an observer form of the *Multifactor Leadership Questionnaire* described below.

The *Mini-Markers* personality inventory is a 40-item inventory that produces a profile of your personality for five broad personality domains commonly called the "Big Five" or "Five-Factor Model." These domains represent normal differences in personality that are probably known by your friends and colleagues. This inventory will not reveal any secret information about you, nor will it assess any serious psychological problems. Mini-Markers is not a clinical instrument. The report is designed to be objective, not

necessarily pleasing or flattering. Because the inventory uses a limited number of items to estimate complex personality domains, your scores will be sensitive to errors of measurement and will not necessarily agree with measures of the same traits using other items. If people who know you well disagree with the results of this inventory, then the inventory results are probably wrong. If you answer the items carelessly or intentionally try to distort the results, then the results will be incorrect. Mini-Markers requires approximately 8 minutes to complete.

The *Watson-Glaser Critical Thinking Appraisal*[™] is an 80-item test that assesses your ability to think critically. The appraisal is divided into 5 subtests that assess inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments. The appraisal requires approximately 40 minutes to complete.

The *Multifactor Leadership Questionnaire* is a 45-item questionnaire in which you describe your leadership style as you perceive it. If you answer the items carelessly or intentionally try to distort the results, then the results will be incorrect. The questionnaire requires approximately 10 minutes to complete.

You must be at least 18 years of age to participate in this study.

Risks

Your participation in this study does not involve any physical risk to you. There is a very low possibility that completion of one or more study questionnaires will lead to some mental discomfort as a result of your consideration of aspects of yourself with which you are not satisfied.

Benefits

You may find that contributing to scientific research gives you a sense of involvement and satisfaction. You may also find answering these questionnaires to be interesting and informative. If you specify that you would like to receive the results of the personality, critical thinking, and leadership questionnaires that you complete, I will be happy to send them to you. The results of these questionnaires may help you understand how you stand on the dimensions that the questionnaires assess, and you may find this information to be helpful in your role as a leader and in other aspects of your life. Additionally, if you specify that you would like to receive a summary of the results of the study, I will send you a summary after the study is completed.

Your participation in this study may aid in our understanding and refinement of leadership models that relate personality and cognition to leadership performance. This understanding may, in turn, benefit the development of leadership development programs on college campuses.

Alternatives

You have the alternative to choose not to participate in this research study.

Confidentiality

I will protect the confidentiality of the information that you provide. I will not reveal the fact that you participated in the study or link your identity to the information or answers you give to any of the study questionnaires without first asking for your permission to do so.

Although it is essential that I gather personally identifying information about you so that I can communicate with you and link your questionnaire responses, I will destroy my records of your name and email address after the need for this information has passed.

Similarly, I will protect the confidentiality of the members of your organization that you nominate to complete the observer form of the *Multifactor Leadership Questionnaire*. I will not reveal to you or anyone else which, or even if any, of your nominees participated in the study and I will not reveal the questionnaire answers or results of any who participate.

Results of this study will be used to complete my dissertation and may be used for teaching, research, publications, or presentations at scientific meetings.

Financial Information

You will not be charged for any study-related procedures.

You will not be paid for your participation in this study.

You may specify that you would like to be included in a drawing for one of three cash prizes of \$50.00 each, to be awarded to study participants who complete all requested questionnaires. I will conduct this drawing at the completion of the study and notify winners by email so that delivery of the prize may be arranged.

Your Rights

Your participation in this study is voluntary and you are free to withdraw at any time. Your refusal to participate or withdrawal from the study will involve no penalty or loss of benefits to which you are otherwise entitled.

Contact Persons

Any questions you may have about this study may be directed to Arnold Leonard at alleon@wm.edu or (757) 999-1111. Questions about your rights as a research participant or dissatisfaction with any aspect of this study may be directed to the Chair of the Protection of Human Subjects Committee at the College of William and Mary, Dr. Michael Deschenes, at mrdesc@wm.edu or (757) 221-2778.

Consent

If I have additional questions, I have been told who to contact. I agree to participate in the research study described above. I acknowledge that I will have the opportunity to give the researcher and/or the College of William and Mary Protection of Human Subjects Committee feedback.

I am aware that I must be at least 18 years of age to participate.

The entry of my name below and selection of the button indicating my agreement to participate signifies my voluntary participation in this study and that I have received a copy of this consent form.

NOTE: To retain a copy of this informed consent page for your records, please use your browser's print function to print a paper copy or the save function to save a copy of the page to your computer's file system.

Please enter your name below and then select the appropriate choice button to indicate whether or not you agree to participate in this research study.

First Name:

Last Name:

I have read and understood this consent form, and I wish to voluntarily participate in this study.

I do not wish to participate in this study. Please exit from the study website.

NOTE: You must select one of the two choices above before the "Submit Choice" button below will work. If you click on the button without indicating your choice, this page will be displayed again.

Submit Choice

Appendix C

Demographic Questionnaire for Leaders

Demographic Information**Student Leader Information**

Please provide the following information about yourself.

First Name:

Last Name:

Sex: Female Male

Age:

- Race: Asian, Asian American
 Black, African American
 Hispanic, Latino, Mexican American
 Native American, American Indian
 White, Caucasian, European American
 Other (please specify)

What is the name of the student organization that you lead?

NOTE: If you are the leader for more than one organization that is officially recognized by your college or university, please choose the one that offers the best opportunity for you and other members of the organization to describe your leadership of the organization.

Please choose one category from the list below that best describes this organization. If no listed category fits, choose "Other" and enter a brief category description in the blank next to this choice.

- Academic Arts
 Athletics Greek (fraternity or sorority)
 Honor Society Media (paper, magazine, radio, etc.)
 Religious Service
 Special Interest Student Government
 Other

How many months have you been the leader of this organization?

What is the approximate number of members in this organization?

Please rate the activity level of this organization, considering such things as the frequency of meetings and other activities and the level of participation by organizational members.

- Low Activity ----- High Activity
- 1 2 3 4 5 6

What is your declared or intended academic major? If you are a double major, enter one major in each blank.

Do not enter academic minors, certifications, etc.

Major 1:

Major 2:

Please consider how creative you consider yourself to be and indicate your level of creativity by selecting the choice button on the scale below.

Low Creativity - - - - - High Creativity

1	2	3	4	5	6
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please nominate three members of the student organization you lead who know you well enough to complete an observer questionnaire about your leadership style. Please nominate one member who is easy to lead, one who is average to lead, and one who is difficult to lead.

NOTE: I will ask these members to participate in the study. I will tell them that you have nominated them, but I will not tell them anything about the category in which you have placed them (i.e., as easy, average, or difficult to lead).

Easy to lead:

First Name:

Last Name:

Email Address :

Average to lead:

First Name:

Last Name:

Email Address :

Difficult to lead:First Name: Last Name: Email Address :

As a token of my appreciation for your participation in this study, I offer you the opportunity to be entered into a drawing for one of three cash prizes of \$50.00 each, to be awarded to study participants who complete all requested questionnaires. Please indicate below whether or not you wish to be entered into the drawing.

- Yes, please enter me in the drawing.
- No, thanks. I do not want to participate in the drawing.

I would be pleased to send you a summary of the outcomes of the *Foundations of Leadership Study* at its conclusion. Please indicate below whether or not you wish to receive a summary of the study.

- Yes, please send me a summary of the study.
- No, thanks. I do not want to receive a study summary.

I would also be happy to send you the results of the personality, critical thinking, and leadership questionnaires that you complete for the study. You might find the feedback from these instruments to offer useful personal insights. Please indicate below whether or not you wish to receive feedback on the instruments you complete.

- Yes, please send me feedback on the instruments I complete.
- No, thanks. I do not want to receive instrument feedback.

If you indicated above that you would like to participate in the drawing, receive a summary of the study outcomes, and/or receive feedback on the instruments you complete, please enter the email address at which you would like to be contacted regarding these choices.

Appendix D

Participant Solicitation Email for Observers



The College of

WILLIAM & MARY

School of Education
P.O. Box 8795
Williamsburg, VA 23187-8795

February 1, 2005

Franklin Smith
Students for Learning
College of William and Mary

Dear Franklin,

If you received this email last night, I apologize for the duplicate mailing. I accidentally sent a few emails before I intended to.

I am sending you this letter because you have been identified by Jane Doe as a member of the student organization named above, which she currently leads or has led in the recent past. Jane has nominated you to participate in this study of college student leadership by completing a short questionnaire about her leadership performance. Because you have been able to observe Jane as a leader, your participation in this study would be extremely helpful. Participation should require less than 15 minutes of your time.

I am a doctoral candidate in the closing months of my program of study here at The College of William & Mary. I am currently working on my dissertation which examines the relationship of personality traits and critical thinking ability to the leadership performance of college student leaders.

Many colleges place a high value on the development of students to assume roles of leadership in society. A large number of colleges have implemented formal leadership development programs for students, and virtually all colleges offer opportunities for interested students to pursue positions of leadership on campus. Yet, despite

this widespread emphasis on leadership development, little is known about the personality and cognitive attributes that underlie college student leadership performance. This dissertation study is designed to examine these attributes so that more effective college student leadership development programs may be designed.

I know that this is a busy time for you, but I really need your help. That is why I have selected questionnaires that should take a total of less than 15 minutes of your time. In addition, to make participation as easy as possible for you, I have set-up a secure website through which you can complete the questionnaires used in the study. At this website you will find a full description of the participation that I am asking of you and your rights as a research participant. After reading this information you will have the opportunity to indicate your choice to participate in the study or not.

The website address and your personal login information is as follows:

Website address: ...<https://alleon.people.wm.edu/>
User ID:.....smithfr
Password:.....CubedToken
Select“Observer” button

Please be assured that as allowed by the law I will protect the confidentiality of the information you provide to me. I will not reveal to the student leader that you have been asked to rate or to anyone else whether or not you actually participated in the study. I will not link your identity to the information or answers you give to any of the study questionnaires without first asking for your permission to do so.

As a token of my appreciation, I will enter you into a drawing for one of three cash prizes of \$50.00 each, to be awarded to study participants who complete all requested questionnaires. In addition, I would be happy to send you a summary of the results of the study upon its completion. Please indicate your desire to be entered into the cash prize drawing and/or receive the study summary by checking the appropriate blocks on the personal information questionnaire on the study website.

This study has been approved by both my dissertation committee and The College of William and Mary Protection of Human Subjects Committee.

If you have any questions regarding this study, please feel free to contact me at (757) 999-1111 or alleon@wm.edu.

Sincerely,

Arnold L. Leonard

Arnold L. Leonard
Doctoral Candidate

This project was found to comply with appropriate ethical standards and was exempted from the need for formal review by the college of William and Mary protection of human subjects committee (phone: 757-221-3901) on November 17, 2004 and expires on November 16, 2005.

Appendix E

Demographic Questionnaire for Observers

Demographic Information**Student Observer Information**

Please provide the following information about yourself.

First Name:

Last Name:

Sex: Female Male

Age:

Race:

Asian, Asian American

Black, African American

Hispanic, Latino, Mexican American

Native American, American Indian

White, Caucasian, European American

Other (please specify)

What is your declared or intended academic major? If you are a double major, enter one major in each blank.

Do not enter academic minors, certifications, etc.

Major 1:

Major 2:

The following questions pertain to the student leader whose leadership performance you have been asked to rate, to the organization to which you and the student leader both belong, and to your observations of the student leader.

What is the name of the student leader whose leadership performance you have been asked to rate?

First Name:

Last Name:

What is the name of the student organization that this student leads and to which you also belong?

Please choose one category from the list below that best describes this organization. If no listed category fits, choose "Other" and enter a brief category description in the blank next to this choice.

- Academic Arts
 Athletics Greek (fraternity or sorority)
 Honor Society Media (paper, magazine, radio, etc.)
 Religious Service
 Special Interest Student Government
 Other

How many months have you been able to observe this student leader lead this organization?

What is the approximate number of members in this organization?

Please rate the activity level of this organization, considering such things as the frequency of meetings and other activities and the level of participation by organizational members.

Low Activity - - - - - High Activity

1 2 3 4 5 6

How accurately do you believe you are able to judge the leadership performance of this student leader?

Low Accuracy - - - - - High Accuracy

1 2 3 4 5 6

How much contact or interaction have you had with this student leader outside of the meetings and functions of the organization to which you both belong?

Low Interaction - - - - - High Interaction

1 2 3 4 5 6

How involved or active have you been in the organization to which you and the student leader both belong?

Low Activity - - - - - High Activity

1 2 3 4 5 6

How successful has this student leader been in helping the organization to which you both belong meet its purpose and goals?

Low Success - - - - - High Success

1 2 3 4 5 6

How creative do you consider this student leader to be?

Low Creativity	-----				High Creativity
1	2	3	4	5	6
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

As a token of my appreciation for your participation in this study, I offer you the opportunity to be entered into a drawing for one of three cash prizes of \$50.00 each, to be awarded to study participants who complete all requested questionnaires. Please indicate below whether or not you wish to be entered into the drawing.

- Yes, please enter me in the drawing.
- No, thanks. I do not want to participate in the drawing.

I would be pleased to send you a summary of the outcomes of the *Foundations of Leadership Study* at its conclusion. Please indicate below whether or not you wish to receive a summary of the study.

- Yes, please send me a summary of the study.
- No, thanks. I do not want to receive a study summary.

If you indicated above that you would like to participate in the drawing and/or receive a summary of the study outcomes, please enter the email address at which you would like to be contacted regarding these choices.

Submit Answers

Appendix F

Welcome and Orientation Webpage

Foundations of Leadership Study

Thank you for considering participation in the *Foundations of Leadership Study*. The purpose of this study is to examine models of personality and critical thinking ability as predictors of leadership behavior.

There are two groups (roles) of participants in this study:

- **Leader** - One group of participants consists of undergraduate college students who are currently acting as the formal leader of a student organization that is officially recognized by the students' college or university. Participating organizations include clubs, societies, Greek organizations, athletic teams, and others. These student leaders will be asked to complete four short questionnaires that gather demographic information, assess critical thinking ability, and describe personality dimensions and leadership style.
- **Observer** - The second group of participants consists of members of student organizations who will be asked to complete two questionnaires that gather demographic information and describe the leadership style of their organization's student leader.

If you have been invited to participate in this study and have received a user ID and password from the study's principle researcher, please click on the appropriate button below that describes the role that you have been asked to fulfill in the study. This button will take you to a page that further describes the study and informs you about your role and the limitations of the study. You will be asked to indicate your willingness to participate in the study and, after you have done so, you will be able to complete the questionnaires that pertain to your role in the study.



Click this button if you have been asked to participate as a student leader.



Click this button if you have been asked to participate as an observer of a student leader.

Appendix G

Questionnaires Webpage for Leaders

Leader Questionnaires

Foundations of Leadership Study

Student Leader Participants

I would like to express my sincere appreciation for your willingness to contribute your time and effort to participation in the *Foundations of Leadership Study*. If the results of the study are to be statistically meaningful and have practical utility, it is critical that a large number of student leaders participate and that these leaders be candid in their responses to the study questionnaires.

There are four questionnaires that I would like you to complete:

The *Basic Information Questionnaire* is a short questionnaire that asks for some basic background information about you and the student organization that you lead.

The *Mini-Markers* personality inventory is a 40-item inventory that produces a profile of your personality along five major personality dimensions commonly called the "Big Five" or "Five-Factor Model." Mini-Markers is not a clinical instrument. That is, it is intended to describe the personalities of normal individuals and it is not designed to detect personality problems or abnormalities. Mini-Markers requires approximately 8 minutes to complete.

The *Watson-Glaser Critical Thinking Appraisal*[™] is an 80-item test that assesses your ability to think critically. The appraisal is divided into 5 subtests that assess inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments. The appraisal requires approximately 40 minutes to complete.

The *Multifactor Leadership Questionnaire* is a 45-item questionnaire in which you describe your leadership style as you perceive it. The questionnaire requires approximately 10 minutes to complete.

Please keep the following points in mind:

- You may complete the four study instruments in any order, but it is essential that you complete all four instruments.
- At the end of each instrument is a button that allows you to submit your answers. It is very important that you click on the submission button to ensure that your answers are recorded.
- After you have submitted your answers you will be returned to this web page so that you may select the next instrument to complete.

- When you have completed and submitted all four instruments, click on the "Exit Study" button below to return to the introductory page of the study. From there, you can close your Internet browser.

Begin by selecting an instrument from the list below:

Basic Information Questionnaire

Mini-Markers Personality Inventory

Watson-Glaser Critical Thinking Appraisal™

Multifactor Leadership Questionnaire

Exit Study

Appendix H

Questionnaires Webpage for Observers

Observer Questionnaires

Foundations of Leadership Study

Student Observer Participants

I would like to express my sincere appreciation for your willingness to contribute your time and effort to participation in the *Foundations of Leadership Study*. If the results of the study are to be statistically meaningful and have practical utility, it is critical that a large number of student observers participate and that these observers be candid in their responses to the study questionnaires.

There are two questionnaires that I would like you to complete:

The *Basic Information Questionnaire* is a short questionnaire that asks for some basic background information about you and the organization to which you and the student leader that you have been asked to rate belong.

The *Multifactor Leadership Questionnaire* is a 45-item questionnaire in which you describe the leadership style, as you perceive it, of the student leader that you have been asked to rate. The questionnaire requires approximately 10 minutes to complete.

Please keep the following points in mind:

- You may complete the two study instruments in any order, but it is essential that you complete both instruments.
- At the end of each instrument is a button that allows you to submit your answers. It is very important that you click on the submission button to ensure that your answers are recorded.
- After you have submitted your answers you will be returned to this web page so that you may select the next instrument to complete.
- When you have completed and submitted both instruments, click on the "Exit Study" button below to return to the introductory page of the study. From there, you can close your Internet browser.

Begin by selecting an instrument from the list below:

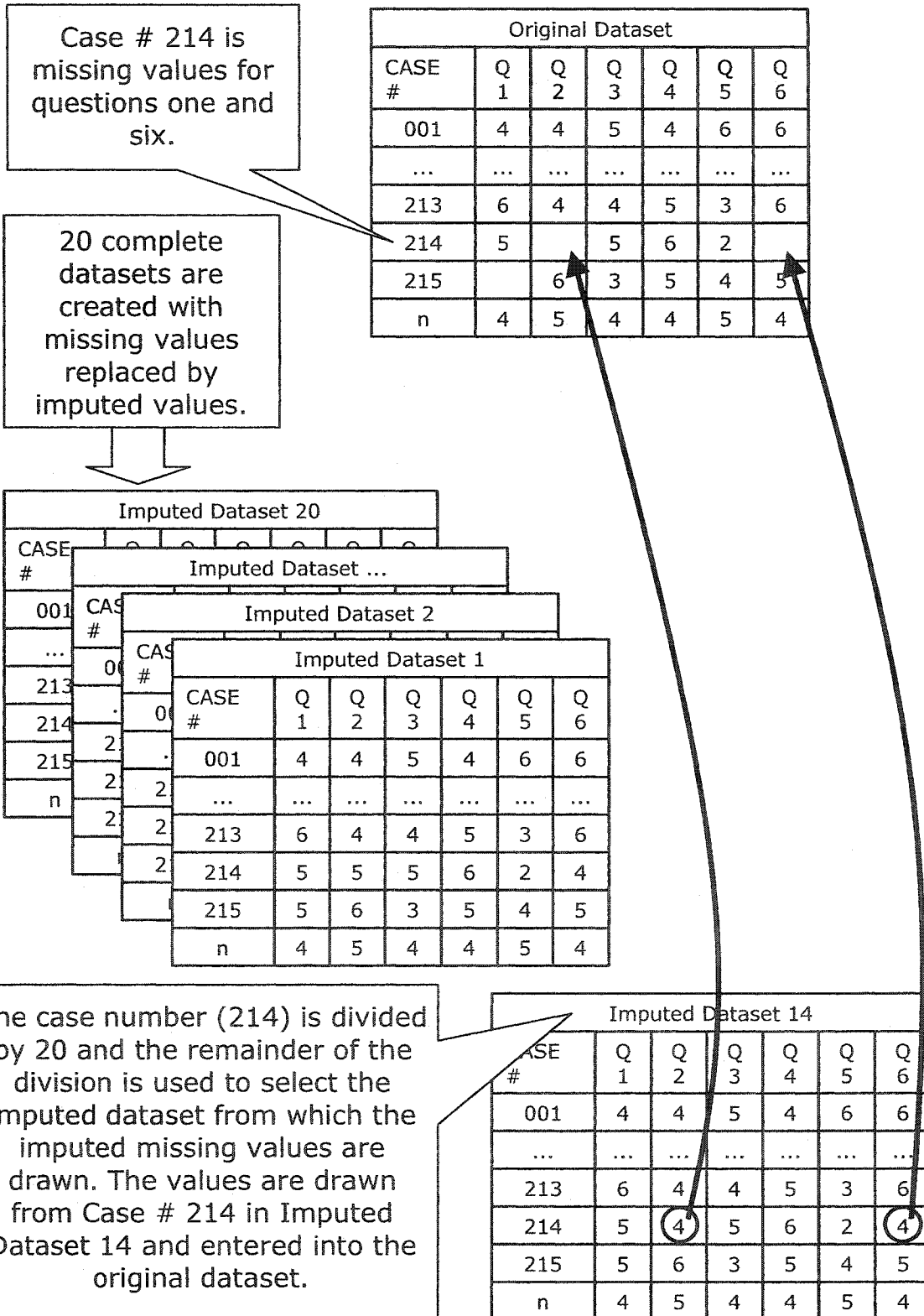
Basic Information Questionnaire

Multifactor Leadership Questionnaire



Appendix I

Replacement of Missing Data from Multiple Imputed Datasets



Appendix J

Mini-Markers Factor Analysis – Five Factor Solution

	Factor				
	I	II	III	IV	V
Quiet	.853*	-.011	-.030	.048	-.022
Shy	.850*	.051	-.064	.132	.044
Extraverted	.748*	.028	.141	-.094	.034
Bashful	.723*	.056	-.127	.152	.038
Talkative	.670*	.005	.135	-.157	.021
Withdrawn	.564*	.227	.222	.240	.005
Bold	.514*	-.011	-.150	-.092	.157
Energetic	.433*	.162	.270	.054	.141
Disorganized	.035	.867*	.052	.067	-.071
Organized	.003	.834*	.106	-.012	-.029
Sloppy	.043	.672*	.146	.157	.074
Inefficient	.123	.661*	.022	.151	.067
Careless	-.072	.560*	.154	.227	.031
Efficient	.153	.467*	.000	.073	.077
Systematic	.047	.425*	.060	-.069	.021
Practical	-.020	.278*	.045	.015	.011
Sympathetic	.022	-.010	.723*	-.029	.105
Warm	.133	.104	.655*	.024	.085
Kind	.025	.124	.647*	.008	.121
Unsympathetic	.029	.141	.633*	.063	.151
Cold	.177	.108	.592*	.236	-.022
Harsh	-.102	.029	.566*	.356	-.052
Cooperative	-.053	.098	.454*	.198	.008
Rude	-.070	.195	.449*	.344	.038

	Factor				
	I	II	III	IV	V
Jealous	.065	.059	.036	.777*	.063
Envious	.084	.044	.014	.771*	.056
Unenvious	.018	-.003	.019	.655*	-.019
Temperamental	-.119	.154	.242	.520*	-.009
Touchy	-.080	.119	.076	.486*	-.059
Moody	.033	.080	.199	.484*	-.056
Fretful	.148	.062	.034	.420*	.000
Relaxed	-.053	-.097	.215	.267*	.005
Creative	.068	-.075	.073	.013	.879*
Uncreative	.076	.016	.066	.172	.830*
Imaginative	.106	-.070	.105	.004	.810*
Deep	.018	.039	.082	-.052	.379*
Philosophical	-.002	.016	-.012	-.043	.373*
Intellectual	.029	.122	.042	.000	.296*
Unintellectual	.112	.203	.149	.029	.278*
Complex	-.059	-.079	-.129	-.234	.257*

Note. Extraction Method: Maximum Likelihood. Rotation Method: Varimax

with Kaiser Normalization. Rotation converged in 6 iterations. $N = 596$

(college student leaders aged 18-26; 333 female, 263 male). Missing data

replaced by multiple imputation method. *Indicates highest factor loading of

each item. I = Extraversion, II = Conscientiousness, III = Agreeableness, IV =

Emotional Stability, V = Openness.

Appendix K

Mini-Markers Factor Analysis – Six Factor Solution

	Factor					
	I	II	III	IV	V	VI
Quiet	.855*	-.014	-.032	.040	-.076	.001
Shy	.849*	.051	-.061	.128	-.003	.045
Extraverted	.748*	.022	.131	-.087	.036	.015
Bashful	.722*	.059	-.122	.147	.026	.028
Talkative	.671*	-.002	.124	-.141	.069	-.018
Withdrawn	.567*	.227	.228	.219	-.104	.039
Bold	.514*	-.011	-.156	-.076	.136	.112
Energetic	.437*	.161	.270	.045	.028	.123
Disorganized	.037	.868*	.057	.047	-.124	-.041
Organized	.006	.828*	.109	-.025	-.056	-.027
Sloppy	.047	.674*	.158	.131	-.030	.076
Inefficient	.127	.663*	.032	.147	.060	.026
Careless	-.068	.563*	.169	.205	-.020	.032
Efficient	.156	.470*	.001	.081	.146	.013
Systematic	.051	.427*	.060	-.061	.182	-.065
Practical	-.018	.282*	.045	.019	.135	-.043
Sympathetic	.027	-.016	.731*	-.023	.212	.006
Warm	.137	.099	.649*	.016	.041	.058
Unsympathetic	.035	.140	.648*	.055	.162	.068
Kind	.029	.120	.643*	.004	.107	.071
Cold	.180	.104	.604*	.203	-.203	.046
Harsh	-.102	.029	.582*	.316	-.219	.029
Rude	-.067	.199	.462*	.313	-.083	.063
Cooperative	-.052	.098	.455*	.187	.006	.004

	Factor					
	I	II	III	IV	V	VI
Envious	.082	.055	.025	.807*	.086	.040
Jealous	.064	.071	.050	.807*	.087	.043
Unenvious	.016	.005	.026	.693*	.125	-.058
Temperamental	-.117	.164	.259	.476*	-.127	.046
Touchy	-.080	.127	.091	.448*	-.180	.016
Moody	.034	.089	.213	.446*	-.125	-.007
Fretful	.147	.070	.047	.398*	-.063	.031
Relaxed	-.053	-.091	.220	.251*	-.008	.016
Deep	.023	.054	.090	-.023	.641*	.151
Intellectual	.035	.141	.050	.031	.616*	.071
Philosophical	.003	.032	-.004	-.018	.588*	.169
Complex	-.057	-.072	-.133	-.200	.512*	.078
Unintellectual	.121	.219	.166	.043	.479*	.093
Creative	.074	-.062	.091	-.018	.190	.899*
Uncreative	.083	.033	.092	.139	.181	.820*
Imaginative	.114	-.057	.122	-.010	.297	.740*

Note. Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 6 iterations. $N = 596$ (college student leaders aged 18-26; 333 female, 263 male). Missing data replaced by multiple imputation method. *Indicates highest factor loading of each item. I = Extraversion, II = Conscientiousness, III = Agreeableness, IV = Emotional Stability, V = Thought Complexity or Orientation, VI = Mental Productivity

Appendix L

Multifactor Leadership Questionnaire (Self) Factor Analysis

Three Factor Solution

Item	Scale	Factor		
		I	II	III
MLQS31	IC	.687*	-.079	.003
MLQS32	IS	.627*	.000	-.047
MLQS30	IS	.627*	.014	.044
MLQS14	II(B)	.590*	-.159	.216
MLQS26	IM	.571*	-.205	.125
MLQS34	II(B)	.524*	-.160	.191
MLQS13	IM	.510*	-.346	-.020
MLQS16	CR	.505*	-.189	.276
MLQS15	IC	.496*	-.111	.112
MLQS36	IM	.466*	-.328	.011
MLQS25	II(A)	.413*	-.268	.171
MLQS18	II(A)	.405*	-.347	.024
MLQS08	IS	.403*	-.049	-.002
MLQS10	II(A)	.396*	-.079	.133
MLQS21	II(A)	.380*	-.291	.078
MLQS19	IC	.357*	-.124	-.090
MLQS09	IM	.348*	-.186	-.085
MLQS35	CR	.345*	-.309	-.026
MLQS29	IC	.328*	-.047	.004
MLQS06	II(B)	.298*	.022	.085
MLQS23	II(B)	.293*	-.169	.029
MLQS11	CR	.281*	-.215	.190
MLQS02	IS	.281*	-.020	.156
MLQS01	CR	.165*	-.128	-.004

Item	Scale	Factor		
		I	II	III
MLQS12	MBE(P)	-.128	.634*	.023
MLQS33	LF	-.025	.554*	-.061
MLQS20	MBE(P)	-.103	.513*	.050
MLQS28	LF	-.153	.483*	-.181
MLQS03	MBE(P)	-.107	.443*	-.013
MLQS05	LF	-.094	.429*	.051
MLQS07	LF	-.042	.353*	.025
MLQS17	MBE(P)	-.051	.261*	.140
MLQS27	MBE(A)	.080	.097	.714*
MLQS24	MBE(A)	.180	.015	.577*
MLQS22	MBE(A)	.044	-.016	.559*
MLQS04	MBE(A)	.025	.042	.540*

Note. Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 5 iterations. $N = 466$ (college student leaders aged 18–26; 281 female, 185 male). Missing data replaced by multiple imputation method. *Indicates highest factor loading of each item. Factors are: I = Transformational–Contingent Reward, II = Passive–Avoidant, III = Management by Exception (Active). MLQ scales are: II(A) = Idealized Influence (Attributed), II(B) = Idealized Influence (Behavior), IM = Inspirational Motivation, IS = Intellectual Stimulation, IC = Individual Consideration, CR = Contingent Reward, MBE(A) = Management by Exception (Active), MBE(P) = Management by Exception (Passive), LF = Laissez-faire.

Appendix M

Multifactor Leadership Questionnaire (Rater) Factor Analysis

Three Factor Solution

Item	Scale	Factor		
		I	II	III
MLQR31	IC	.733*	.219	.123
MLQR10	II(A)	.730*	.285	.060
MLQR30	IS	.702*	.170	.179
MLQR21	II(A)	.696*	.426	-.088
MLQR32	IS	.694*	.214	.170
MLQR35	CR	.686*	.206	-.114
MLQR01	CR	.650*	.285	.031
MLQR26	IM	.641*	.304	.167
MLQR34	II(B)	.627*	.294	.075
MLQR13	IM	.622*	.350	-.022
MLQR36	IM	.610*	.324	-.040
MLQR16	CR	.606*	.236	.196
MLQR14	II(B)	.599*	.248	.201
MLQR18	II(A)	.594*	.372	.005
MLQR08	IS	.588*	.272	-.081
MLQR09	IM	.587*	.200	-.080
MLQR19	IC	.585*	.240	-.114
MLQR02	IS	.576*	.311	.139
MLQR15	IC	.548*	.189	.217
MLQR23	II(B)	.486*	.236	.063
MLQR25	II(A)	.432*	.355	.301
MLQR11	CR	.424*	.275	.189
MLQR06	II(B)	.348*	-.020	.177
MLQR29	IC	.297*	-.025	.038

Item	Scale	Factor		
		I	II	III
MLQR12	MBE(P)	-.272	-.787*	.043
MLQR03	MBE(P)	-.161	-.653*	.046
MLQR20	MBE(P)	-.150	-.627*	.062
MLQR28	LF	-.262	-.545*	-.183
MLQR05	LF	-.218	-.542*	-.083
MLQR33	LF	-.306	-.524*	.032
MLQR07	LF	-.200	-.501*	.055
MLQR17	MBE(P)	-.092	-.275*	-.047
MLQR27	MBE(A)	-.043	-.158	.617*
MLQR04	MBE(A)	.007	-.073	.608*
MLQR24	MBE(A)	.118	.063	.563*
MLQR22	MBE(A)	.133	.155	.436*

Note. Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 5 iterations. $N = 468$ (college student observers aged 18–52, 8 above age 26; 289 female, 179 male). Missing data replaced by multiple imputation method. *Indicates highest factor loading of each item. Factors are: I = Transformational–Contingent Reward, II = Passive–Avoidant, III = Management by Exception (Active). MLQ scales are: II(A) = Idealized Influence (Attributed), II(B) = Idealized Influence (Behavior), IM = Inspirational Motivation, IS = Intellectual Stimulation, IC = Individual Consideration, CR = Contingent Reward, MBE(A) = Management by Exception (Active), MBE(P) = Management by Exception (Passive), LF = Laissez-faire.